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# PATHOLOGY AND TREATMENT
OF
# STRICTURE OF THE URETHRA

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THE

# PATHOLOGY AND TREATMENT

OF

# STRICTURE OF THE URETHRA

AND

# URINARY FISTULÆ

BY

SIR HENRY THOMPSON, F.R.C.S., M.B. Lond.

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CORRESPONDING MEMBER OF THE SOCIETY OF SURGERY OF PARIS
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*Μέγα δὲ μέρος τῆς τέχνης τὸ δύνασθαι σκοπεῖν.*

Hipp. *Epid. III.*

T47
1885

# PREFACE TO THE FOURTH EDITION.

THE LAST EDITION of this work having been long out of print, I have prepared a new one, and will indicate briefly the main changes which have been made.

I have reduced the bulk of the work by upwards of a hundred pages; first, by removing matter which in the former edition related to controversial points under discussion at the time of publication, but since, for the most part, settled, and therefore no longer necessary to be reconsidered in detail here.

Secondly, I have removed entirely all the 'illustrative cases.' These appeared at the outset of my work to be necessary; and some were cited in support of statements which were at that time not generally accepted. Another reason for removing the cases is, the conviction that it is a better and simpler method for me, after another ten years' experience, to give its results in the form of opinions, as simply and briefly expressed as possible, unencumbered by those guarantees which might naturally be expected from an author in an early part of his career. On the other hand, several additions have been made in various parts of the work, relating to treatment, the result of therapeutical progress and more extended observations; and the number of illustrative wood engravings has been considerably augmented.

Lastly, the matter of the work has been almost rewritten, in order to attain greater clearness of expression, and for the purpose of producing in the present and somewhat smaller work a more useful epitome of the subject than the original and larger one contained.

WIMPOLE STREET, CAVENDISH SQUARE, LONDON:
*May* 1885.

101349

# PREFACE TO THE FIRST EDITION.

THE FOLLOWING WORK consists of the Treatise to which the Jacksonian Prize, for the year 1852, has recently been awarded by the Council of the Royal College of Surgeons of England.

The subject named by the Council, and announced for public competition in the summer of 1851, was, 'The Pathology and Treatment of Stricture of the Urethra.'

From these terms it may be inferred that a comprehensive view of the various important lesions commonly understood to be included under the denomination of STRICTURE, as well as of others which are intimately related to them, was required by the Council.

In the following attempt to execute a task of such magnitude and extent, the Author is painfully conscious of the degree to which he has come short of its accomplishment. The subject is one which embraces very wide and important relations. The possession of manual dexterity, and a practical familiarity with the best mechanical appliances, on the part of the surgeon, are absolutely indispensable to the successful treatment of Stricture; but these alone constitute only a part of the agency which must be brought to bear upon a large proportion of the cases which he meets with in practice. An acquaintance with the pathology of the entire genito-urinary system is necessary, and must be patiently and assiduously cultivated. The numerous sympathetic relations with every part of the animal economy which this important part of it sustains, through the medium of the nervous system, have constantly to be recognised and apprehended. To enter fully on the consideration of these topics would require, not one volume, but several. A brief review of those which are to be regarded as possessed of primary importance could only be attempted within the limits of this work. On these grounds, therefore, no apology appears to be necessary on the Author's part for offering so large a volume to the notice of his professional brethren.

It may be desirable, very briefly, to denote the plan which has been adopted in the arrangement of the materials which constitute the work.

Firstly: The observations and opinions of those writers who have paid especial attention to the subject are, on most points, collated and adduced. In each case the writer's words are quoted, and direct reference is made to the page and edition of his book.

Secondly: Original researches have been made, as far as it has been within the Author's means to do so, and their results are compared with the foregoing. Thus, the Chapter on the Pathological Anatomy of Stricture is mainly a digest of the facts now exhibited in the Principal Museums belonging to the Medical Schools of London, Edinburgh, and Paris, in which each preparation has been individually examined by himself. A reference is made in the text to various specimens of importance, and an account of these is placed in the Appendix, the bulk of which is thus somewhat increased, rather, however, for the purpose of facilitating the student's acquaintance with unquestionable examples and illustrations of the facts stated, than to furnish a body of matter possessing general interest and value.

Thirdly: In relation to the natural history, and to the treatment of Stricture, a certain number of cases, hitherto unpublished, have been placed in the Appendix, under the head of 'REPORTED CASES,' for the purpose of illustrating numerous points connected with these divisions of the subject. Following these is a 'TABLE OF CASES,' 220 in number, each containing a very brief statement of the chief incidents in the history of the patient, and his present condition, condensed from fully reported cases only, upon the aggregate of which have been founded, in a great measure, the Chapters on 'The Symptoms' and on 'The Causes of Stricture.'

It has been deemed necessary to discuss somewhat at length the *quæstio vexata* of the present day, viz. that of cutting operations for Stricture performed from the perineum. Certain data required for this purpose will be found under the head of 'OUTLINES OF CASES,' which are merely very short histories, containing the principal facts bearing upon this question.

Lastly: Respecting the anatomical relations of the normal as well as of the diseased urethra, no pains have been spared in order to develop the best practical mode of conveying, as far as this can be done on paper, sound information upon this important subject. It will be seen that a great number of bodies have been examined to supply the facts related. One, out of several illustrative preparations which were sent into the College of Surgeons with the Essay, contained portions of the corpus spongiosum from not less than twelve bodies, to illustrate a point in its anatomy referred to at pages 36–38.

The Author has now only to present his grateful acknowledgments to the Council of University College, London, for permission freely granted in any way to make use of the valuable Case-books of the late Mr. Liston; to Mr. Erichsen, the esteemed Professor of Surgery in the College, for liberty to examine and publish the cases of any patients under his care in the hospital, which might illustrate the subject; to those gentlemen who have readily assisted him in the pursuit of information respecting patients formerly under their care, among whom he is especially bound to name Mr. Syme, who has also afforded him every facility for observing his practice, both public and private; Mr. Fergusson, Mr. Cock, and Mr. Coulson, besides numerous others in various parts of the country, who have most promptly responded to his inquiries; and, lastly, to his old friend and formerly fellow-student, Mr. Squire, late surgeon to the St. Marylebone Infirmary, for the invaluable opportunities he has at all times afforded him of prosecuting practical researches at that institution.

16 Wimpole Street, Cavendish Square:
*December* 1853.

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# STRICTURE OF THE URETHRA.

## CHAPTER I.

### THE ANATOMY AND PHYSIOLOGY OF THE MALE URETHRA.

It will be essentially necessary, in order to understand clearly the subject of this essay, in its numerous and important relations, first, to study the anatomy of the healthy male urethra, and inquire into its physiological action and uses. In doing so, I shall collect and review the labours of the chief authorities, adding the results of such investigations as I have myself made in relation to certain points which seemed to require further elucidation.

It will be unnecessary to adduce reasons in support of this mode of proceeding. The study of anatomy and physiology is too generally admitted as the only sound basis on which to conduct intelligent researches into the meaning of pathological phenomena to admit of he adoption of any other course. But in the subject before us, viz. the pathology of urethral stricture, a practical examination of the structure and functions of the healthy urethra is especially necessary, since previous writers have expressed very different opinions in relation thereto.

It will be necessary first to examine the urethra proper; and secondly, the neighbouring parts which can exercise any influence, mechanically or vitally, upon its form and condition.

**1. The Urethra Proper.**—This term applies to the canal which leads from the urinary bladder to the external orifice, *meatus urinarius*, at the extremity of the penis, in the male, or within the vulva in the female. It may be regarded as made up of a mucous membrane, and certain tissues adjacent, which, for the present, may be included under the general term, 'submucous,' and the nature of which shall be presently examined.

a. *Length of the adult male urethra in health.*—The length of the urethra in the adult male has been differently stated, for it varies considerably in different subjects, as it does also in the same individual, under different circumstances, since the parts are exceedingly extensible, and may be readily made to correspond to any given measure ment. These sources of difference are sufficiently obvious to the anatomist, and forcibly prove the necessity of following some constant method, in the examination of each urethra, if accurate results are to be attained.

I accordingly pursued the following course, with a view to the solution of this question, in examining a considerable number of bodies placed at my disposal many years ago at the Marylebone Infirmary. The penis and bladder having been carefully removed from the pelvis, in the usual manner, the entire passage was laid open along the upper aspect. The parts were then placed, being first moderately extended, upon some smooth polished surface, as on a common earthenware dish, and so permitted to take, by their own elasticity, any form or length which their component structures might determine. The measuring tape was then applied; and the average result of its application to 16 adult bodies was as follows:

| | | |
|---|---|---|
| TOTAL LENGTH, from anterior border of uvula vesicæ to meatus urinarius externus | 8½ | inches |
| Dividing the canal in the usual manner into spongy, membranous, and prostatic portions, we have: | | |
| Length of *spongy portion* | 6½ | ,, |
| ,, *membranous* ditto | ¾ | ,, |
| ,, *prostatic* ditto | 1¼ | ,, |
| | 8½ | |

The greatest measurement was 9 inches, the smallest 7¾ inches. Of the 16, no less than ten presented measurements which did not deviate more than a quarter of an inch from the average, and ranging within ⅜ of an inch only; that is to say, between 8¼ and 8⅝ inches inclusive.

Mr. Briggs, formerly of the Lock Hospital, made some investigations which came to my knowledge after the post-mortem measurements just recorded had been ascertained. His experiments were made upon the living subject; and, inasmuch as the practical value of such researches must be found in relation to the use of instruments during life, it is confessedly of more importance to ascertain the length of the canal in that condition, than after death. He states that the average length of the urethra is about 7½ to 7¾ inches. I have made many such examinations on the living since that time, and believe that a measurement of 6½ to 7¼ inches indicates the average length of the urethra in adult males, in the ordinary flaccid state of the organ.[1]

---

[1] Mr. Briggs, formerly of the Lock Hospital, published the results of experiments upon a number of persons during life; made by measuring the urethra with a graduated catheter passed into the bladder. He estimated 'the average length of the urethra to be 7½ to 7¾ inches.'—*Treatment of Strictures by Mechanical Dilatation*. London, 1845, p. 9.

It will therefore be borne in mind, that these two measurements, the one of about 7 inches and the other of 8½ inches, may, without doubt, be taken to indicate the average length of the urethra in the two conditions of life and death. That this difference exists it will be particularly important to recollect, since all accurate researches into the pathological anatomy of stricture are, of necessity, confined to an observation of the parts after death, while, in relation to treatment, the measurement during life is that which has to be remembered.

But it is obvious that, during life, the length of the urethra greatly varies with the vascular condition of the penis. Then in different individuals there are, without doubt, also considerable natural variations in the development of this organ; although the length of the canal itself varies less than the external difference remarked might lead an indifferent observer to imagine. Again, in disease, notably in hypertrophy of the prostate, the canal may be considerably lengthened; but, setting aside morbid conditions, a range of between 7 and 8½ inches will include a large proportion of the whole number, all being treated anatomically in the manner described. It is easy to account for the discrepancies which appear, in comparing the measurements of different observers, when it is remembered that the urethra of eight inches may easily be stretched into ten. The same remark will hold good with

---

Adopting another method, he says: 'In a plaster cast of a vertical section of the male pelvis, I find the following to be the proportion of the several parts of the urethra. From the orifice to the membranous part, 6½ inches. From thence to the bladder, 1¾ inches. Total, 8¼ inches.'—*Ibid.* pp. 11, 12.

Mr. Whately examined 48 subjects, and found the average length to be 8½ inches. 'In each of these classes there were some differences in size, and in many of them considerable variations in the length of the projecting part of the penis. The number of tall men was 16. Of these the following is an exact measurement of the different distances from the extremity of the penis to the bladder in each of them, taken while the former was held firmly on the catheter to prevent it from shrinking.

| Sixteen tall men | Twenty-three of middle stature | Nine short |
|---|---|---|
| 1 at 10 inches | 3 at 9½ inches | 1 at 9¼ inches |
| 8 at 9½ ,, | 1 at 9¼ ,, | 2 at 9 ,, |
| 5 at 9 ,, | 7 at 9 ,, | 4 at 8½ |
| 2 at 8½ ,, | 2 at 8¾ ,, | 2 at 8¼ |
| | 7 at 8½ ,, | |
| | 2 at 8¼ ,, | |
| | 1 at 8 ,, | |
| — | — | — |
| 16 | 23 | 9' |

*Improved Method of Treating Strictures.* London, 3rd edition, 1816, pp. 68-9, in a note.

Mr. Benjamin Phillips says: 'The experiments I have made by injecting the erectile tissue composing the corpora cavernosa decidedly confirm the accuracy of Whately's calculations, and justify me in stating the average length of the urethra as varying from eight to nine inches.'—*Treatise on the Urethra.* London, 1832, p.

reference to the relative length of the different divisions, no defined mark existing in the urethra to determine lines of demarcation between them; notwithstanding which their measurements have been calculated with so much nicety as very frequently to be expressed in lines.

b. *Width of the urethra.*—It is difficult to render this in figures from the natural dilatability of the canal in the healthy condition. Anatomists have stated three, four, and five lines as approximative estimates. Surgeons have recorded the passage of calculi through it of four lines or more in diameter, which must of course indicate the amount of extensibility enjoyed by the narrowest portions of the canal. The mucous membrane after death, when treated in the manner already described, is found lying in long, but minute and narrow folds, which are readily obliterated by stretching the membrane in a transverse direction to about double its natural width. In this condition, but unstretched, we obtain measurements as follows; and these, it will be remembered, although denoting the circumference of the canal, convey a very inadequate idea of its real capacity.

| | |
|---|---|
| The neck of the bladder, or commencement of the prostatic portion, measured | $\frac{5}{10}$ to $\frac{6}{10}$ inch |
| The centre of the prostatic portion | $\frac{7}{10}$ ,, |
| Beginning of membranous, or end of prostatic portion | $\frac{5}{10}$ to $\frac{6}{10}$ ,, |
| Middle of membranous part | $\frac{6}{10}$ ,, |
| End of ditto, close to the bulb | $\frac{5}{10}$ ,, |
| Bulbous part of spongy portion | $\frac{7}{10}$ ,, |
| The part within the glans | $\frac{6}{10}$ ,, |
| Meatus externus | $\frac{5}{10}$ ,, |

Thus it will appear that, relatively to each other, different parts of the canal bear certain constant proportions. For example, the external meatus itself is the smallest, except when, as very rarely happens, a congenital contraction exists about a quarter or half an inch from the extremity, and of course within view; next is the point of junction between the membranous portion and the bulb; while the centre of the prostatic portion, and the sinus of the bulb, are the largest. (See fig. 1.)

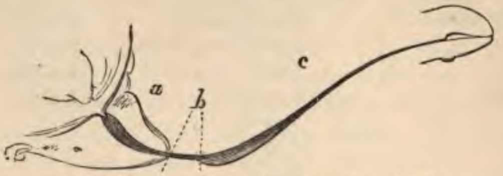

FIG. 1.—Diagram of urethra in natural condition,
*a*, *b*, and *c* representing the prostatic, membranous, and spongy portions respectively.

Dr. Otis, of New York, has suggested that there is a constant relation between the circumferential measurement of the penis and the calibre of the urethra in its healthy condition. He states that 'the correction of this proportionate relation has been verified by the author's careful measurement in over one thousand consecutive cases, without meeting with a single exception, in infancy, childhood, adult age, or old age.'[1] This it must be avowed is a remarkable, and perhaps unique, instance of nature's operations in regard of absolute uniformity. Dr. Otis presents the following table as an illustration of the observations referred to:

*Circumference Midway of the Penis.*

| *Of Penis.* | *Of Urethra.* |
|---|---|
| 3 inches or . . 75 mm. | 30 mm. or more |
| 3¼ ,, . . 81 ,, | 32 ,, |
| 3½ ,, . . 87 ,, | 34 ,, |
| 3¾ ,, . . 93 ,, | 36 ,, |
| 4 ,, . . 100 ,, | 38 ,, |
| 4¼ to 4½ ,, . 105 to 112 ,, | 40 ,, |

After all, it is impossible to regard the canal as a tube, and as susceptible of examination in regard of calibre in any sense which is applicable to a tube. In the living body, the walls of the passage are closely applied to each other in a state of inaction, so that the diameter is only calculable when distension occurs from some cause; and as this has been seen to correspond, within certain limits, to the amount of pressure exerted upon them, any statement respecting calibre is liable to some modification. Indeed, the question of the diameter of the urethra must be considered as resolving itself, to a certain extent, into the measure of its capability of being safely extended; and this is of greater practical import perhaps than any other question respecting it. I have elsewhere described it as a continuous closed valve, capable of transmitting fluids and solids in one direction only, and transmitting nothing whatever in the opposite direction, except in obedience to applied force. It is in the male a long route or chink, traversing soft and most delicate vascular and nervous tissues, its walls or sides always firmly closed, and never opening except for a few seconds, during which fluids have to be transmitted from the body. Then, for a few seconds, it is distended more or less, and becomes a tube for this short time and this only, equalling perhaps, at most, three minutes in the twenty-four hours. During that brief period of distension the passage manifests great deviations in its diameter; being, in fact, very differently affected at various parts of its course by the various structures which surround it.[2]

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[1] *Practical Clinical Lessons*, by F. R. Otis, M.D. New York, 1883, pp. 441-2.

[2] *Clinical Lectures on Diseases of the Urinary Organs*, by the Author. th edition, 1883, Lecture II.

Thus one mode of determining extensibility is the formation of casts of the urethra by means of injections of wax, or, better still, of fusible metal. The former have been frequently employed; among others, by Sir Everard Home, who paid considerable attention to this subject, and he gives the result of experiments on two bodies, one of eighty, and the other of thirty years of age; the measurements recorded being those of the diameter of the casts, at different parts of its course.[1] (See fig. 2.)

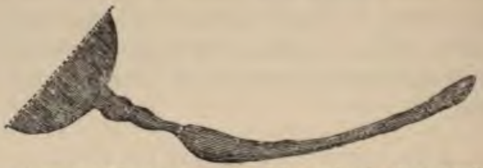

FIG. 2.—Diagram of Urethra, from Sir E. Home, showing its extensibility.

*The Diameter of the Casts of the Urethra in different Parts.*

| | Years | |
|---|---|---|
| | 80 | 30 |
| | Inch | Inch |
| At $\frac{3}{4}$ inch from the external orifice | $\frac{9}{20}$ | $\frac{7}{20}$ |
| At $4\frac{1}{2}$ inches from ditto | $\frac{7}{20}$ | $\frac{7}{20}$ |
| At the bulb, 7 inches from ditto | $\frac{12}{20}$ | $\frac{13}{20}$ |
| In the membranous part, $7\frac{1}{2}$ inches from orifice | $\frac{7}{20}$ | $\frac{4}{20}$[a] |
| In the membranous part, near to the prostate gland, $8\frac{1}{4}$ inches from orifice | $\frac{9}{20}$ | $\frac{7}{20}$ |
| Where the membranous part terminates and the prostate gland begins, $8\frac{1}{2}$ inches from orifice | $\frac{7}{20}$ | $\frac{6}{20}$ |
| In the middle of the prostate, $1\frac{3}{4}$ inches from orifice | $\frac{11}{20}$ | $\frac{10}{20}$ |
| At the neck of the bladder, 9 inches from orifice | $\frac{9}{20}$ | $\frac{8}{20}$ |

[a] 'In this man there had been stricture at this part.'

These casts were nine inches long, but Sir E. Home states, 'that the canal, in the relaxed state, is eight and a half inches' long.[2]

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[1] *Practical Observations on the Treatment of Strictures, &c.* 1805. Vol. i. p. 25.

[2] Respecting Sir E. Home's measurements given in the text, Mr. Phillips says: 'The observations I have made differ only from those of Home in making the diameter a little less considerable, whilst the relative diameter of the different parts was similar to that of the younger subject examined by him.'—*Op. cit.* p. 4.

Lisfranc's measurements, or rather his estimate of the diameter of the urethra in twelve subjects examined, but confessedly not measured by him, are as follows:

| | | |
|---|---|---|
| Commencement of the prostatic portion, next the bladder | 3 to 4 | lines |
| Centre of ditto | 4 to $5\frac{1}{2}$ | ,, |
| End of ditto | 3 to 4 | ,, |
| Beginning of membranous portion | $4\frac{1}{2}$ to 5 | ,, |
| End of ditto | $3\frac{1}{2}$ to $4\frac{1}{2}$ | ,, |
| Behind or near to the bulb, i.e. behind its dilatation | 3 to $3\frac{1}{2}$ | ,, |

The latter mode has been employed by the late Mr. Guthrie and Mr. Quekett, and drawings of two casts are exhibited in the reprint of a lecture given by the former gentleman, before the Medical Society of London, in April 1851.[1]

The value of these researches is found in the practical application of the principles which result from them, to the employment of instruments in the urethra during life. Granted that constant relations of size, between the different parts of the canal, exist, and that the external meatus is known to be, with very few exceptions, the smallest of all, it follows that an instrument which fills that orifice without over-stretching it must be able to pass through its whole course, unless some obstruction be present. Thus, to some extent, it may be regarded as a key to the capacity of the rest of the canal. As regards the actual average of measurements met with in practice, it is seldom that No. 12 (English scale) cannot be fairly introduced into the adult urethra, while No. 15 is often admissible. The diameters of these instruments are, respectively, three-tenths and three and a half tenths of an inch.

We next consider the anatomical divisions of the urethra, which have been used for facility of description, in relation to their external connections and internal conformation. They are three in number, viz. the Prostatic, the Membranous, and the Spongy portions.

The Prostatic Part will be understood to indicate that portion of the canal which traverses the prostate. Its length depends upon the size of this organ, and in health averages about an inch and a quarter.[2] Its width is more constant than that of any other part of the urethra, from the surrounding structure being less susceptible of change in size; at the same time it is more dilatable; while its upper part, close to the neck of the bladder, is more resistant and unyielding. At its commencement, immediately in front of the uvula vesicæ, which seems to

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[1] Vide a Lecture delivered before the Medical Society of London, April 1851, by G. J. Guthrie, F.R.S.

[2] *Length of the Prostatic Portion of the Urethra.*

| | |
|---|---|
| Boyer regards it as varying between . . . . . | 15 and 18 lines |
| Lisfranc ,, ,, . . . . . | 8 and 11 ,, |
| Ducamp ,, ,, . . . . . | 12 and 15 ,, |
| Phillips ,, ,, . . . . . | 12 and 15 ,, |

*Length of the Membranous Portion.*

| | |
|---|---|
| Boyer regards it as about . . . . . . . . | 12 ,, |
| Lisfranc regards it as varying between . . . . | 7 and 11 ,, |
| Ducamp regards it as about . . . . . . . | 9 or 10 ,, |

Phillips considers it as about 'an inch in length superiorly; inferiorly about four or five lines.'

fill up the internal urethral orifice in the ordinary or quiescent condition of the parts, when the urine is not flowing, it is about three or four lines broad, gradually widening to the centre, where it may be about five lines, and narrowing again to three or four, so that it has an ovoid form. Cut transversely, the section appears somewhat triangular, the apex being downwards. It passes through the upper part of the prostate, having generally the greater portion of the organ below it; although sometimes as much appears above as below.

On laying open the urethra here from above, we have the following structures in view. Commencing behind on the floor, continuous with the uvula vesicæ, just named, as bounding its posterior limit, is seen a lightish-coloured thin band of fibres, beneath the mucous membrane, in the form of a line running along the centre (see fig. 10, p. 49), until lost in an eminence, produced by a suddenly rising fold of the mucous membrane and subjacent tissues, prolonged forwards, as a ridge about eight or nine lines in length, and gradually diminishing till it becomes a band similar to that just described, which then fades as it passes on through the membranous into the bulbous portion. This eminence is the verumontanum, caput gallinaginis, or crista urethræ.

In this crest, about a line or two anterior to its summit, may be seen (much more readily in some than in others) a slight depression, through which a small probe may pass into a sac, three or four lines deep, called the sinus pocularis, or utricle; named also, 'vesica prostatica,' by Weber. The common ejaculatory ducts are contained in its walls, one on each side, opening by a narrow slit on the border of its orifice. The prostatic sinuses of the urethra are formed by a depression on either side of the central ridge, and the prostatic ducts open into them by several minute orifices, in number not less than twenty or thirty, easily seen by squeezing the organ, when some brownish viscid liquid issues from them.

The MEMBRANOUS PART was so called by the older anatomists from the supposed absence of any special surrounding body or substance coming into important relation with the membrane-like tube, which here forms the urethra. While the prostate gives its name to the first part, as we have seen, and the spongy erectile tissue is the origin of the term which denotes the third, the condition of the canal itself becomes in this case the source of the nomenclature employed. And it will still be used here, as perhaps, after all, the best, and certainly the best understood, although, adopting the principle which holds good in the other two parts, we might substitute with advantage muscular[1] for membranous portion. Not that the influence of muscular fibre is absent in those, but that it is present especially in this, and constitutes the important feature of this division of the urethra.

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[1] The term 'muscular' was suggested by Cuvier, to denote this portion.

Its length is generally rather over than under stated, one inch, or nearly one inch, being commonly allotted to it; three-quarters is nearer the truth for the upper part, and about half or five-eighths for the lower part or floor, a difference arising from the oblique direction backwards, which the erectile tissue, forming the bulb of the corpus spongiosum, takes, in passing from above downwards. Its posterior limit is formed by the apex of the prostate and posterior layer of the 'deep perineal fascia,' while the anterior layer of the same fascia, corresponding with the termination of the bulb, and being continuous with its fibrous envelope, defines its anterior limit. So that the membranous portion may be regarded as the part which intervenes between these two layers of fascia—in fact, the interfascial division of the urethra.

It is the narrowest division of the urethra, excepting only the meatus itself, and the colour of its mucous membrane is deeper in tint than that of the prostatic part; but an extension of the white line described in the last-named division is seen in this portion to be continued along the floor.

The SPONGY PORTION is that part of the urethra which is encircled by the erectile tissue of the corpus spongiosum, and comprehends all which is anterior to the division last described. It should be remarked that the erectile tissue entirely surrounds the canal throughout this portion, although the layer on the upper surface is thin. The length of this portion is much more variable than that of the others, being increased by erection; its limit, therefore, may range between five and eight inches during life. It is of nearly uniform width, except at its two extremities, a slight enlargement existing at the posterior one, called the 'sinus of the bulb,' belonging chiefly to its floor; and a sudden enlargement at the anterior part, in the glans, within an inch of the meatus, also occupying the inferior surface, called the 'fossa navicularis Morgagnii.' The first-mentioned enlargement is less obvious to the eye, on merely laying open the urethra, than the latter, but it is notably more dilatable, and yields more to injection, as already seen. On the floor of the sinus of the bulb, towards its centre, may be found, sometimes with some difficulty, or not at all, the two small mouths by which the ducts from Cowper's glands enter. These ducts may be often observed or traced running beneath the mucous membrane for a distance of half or three-quarters of an inch. Besides these, are several small lacunæ to be noticed presently. The meatus, as before stated, is the smallest part of the whole canal; some dense fibres being very clearly seen to lie transversely at the extreme end of the canal when opened, which is also surrounded with pale muscular fibres. The direction of the meatus is vertical, and its form that of a narrow slit, about three lines long, the sides of which are formed by two lip-like portions of the surrounding glans penis, united by a commissure above and below; the latter is more strongly marked, and is connected with the 'frænum preputii.'

It is common to use the term '*bulbous portion*' for the purpose of designating the posterior inch, or thereabouts, of the spongy division of the urethra.

The *mucous membrane* of the whole urethra is continuous with that of the bladder, and also at the meatus with the integument of the glans. It is moreover prolonged into the prostatic and seminal ducts, and several small pouches or lacunæ, many of which occupy the floor, while others are found on the upper aspect of the passage, and their apertures, for the most part but not invariably, look towards its external orifice. The largest, 'lacuna magna,' is in the last-named situation, about an inch behind the meatus. Many of these lacunæ are from a third to two-fifths of an inch in length; they run obliquely under the mucous membrane, sometimes among the organic fibres subjacent. Their secretion appears to differ in no respect from common mucus. Besides these, the whole mucous membrane has numerous small follicles and mucous glands. Its epithelium is in part columnar, but chiefly spheroidal, and this gradually becomes tessellated as it approaches the anterior end of the urethra. In the fresh subject the colour is a light pink, deeper at external inch, and also in the membranous part and sinus of the bulb, in front of which the hue is paler; while behind it has a yellow tint towards the bladder.

The whole surface described is lubricated with mucus, and its structure is exceedingly vascular. The membrane has a rugous character anterior to the prostatic portion, where no rugæ exist. In the bulbous part they abound, the mucous membrane being disposed in longitudinal folds, with many small papillæ upon them. Towards the middle of the spongy portion they are less developed, but become prominent in the neighbourhood of the glans. From their close lateral approximation to each other, under ordinary circumstances, the canal is absolutely closed, and presents an appearance, more or less stellate, on transverse section.[1]

The presence of these rugæ seems to be occasioned by the existence of numerous long and slender bands of fibrous tissue, lying immediately beneath the mucous membranes, in a longitudinal direction. These are larger and stronger at each extremity of the canal than in the intermediate part. In the bulbous and membranous portions they are extremely delicate, constituting these the weakest parts of the urethral wall, a fact to be noted in connection with the use of instruments there. These fibres are formed largely of elastic tissue, associated with connective areolar tissue, by which also they are bound together and united with the organic muscular fibres beneath the superjacent mucous membrane, and with numerous interlying minute blood-vessels. And along the roof of the canal throughout almost its whole course, but particularly well marked in the spongy region, exists a continuous band of associated fibres, nearly an eighth of an inch in breadth, which seems to strengthen the wall in this aspect. It can only be properly seen by slitting up the canal along its inferior border.

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[1] Guthrie, *op. cit.* p. 20. Figured also by Bauer in the Plates Nos. 1, 2, and 4, in the third volume of Sir E. Home's work on Stricture. 1821.

The vascularity of the membrane is rendered very obvious by the use of a fine injection, which gives a bright vermilion colour to it throughout. Blood is supplied to the urethra through small branches from the '*artery to the bulb*,' some of which pass through the substance of the corpus spongiosum to reach it, where they form plexuses beneath the basement membrane, and around the lacunæ and glandular crypts, communicating freely among themselves, and at the meatus externus, with small branches of the dorsal artery of the penis. From all these parts it is returned in part by small branches which enter the veins of the bulb and of the cavernous bodies, to join the pubic vein, and in part by the dorsal vein of the penis, which receives a large portion by numerous offsets, and perforates the triangular ligament to join the prostatic plexus. This consists of large venous channels lying between the folds of fascia which envelop the prostate, chiefly along each lateral border, and in the median line upon its upper aspect; these communicate with the hæmorrhoidal veins at the base of the bladder, and are sometimes found of considerable size, especially in elderly subjects.

The nerve to the bulb also sends branches of supply to the urethra, as does also the hypogastric plexus of the sympathetic.

We now arrive at the second division of the structures to be considered in connection with the urethra, viz.:

1. **Fasciæ.**
2. **Muscular Tissues,** voluntary and involuntary, with non-contractile fibres intermixed.
3. **Erectile Tissue.**

**1. The Fasciæ.**—'The deep perineal fascia,' as it is now more generally called (of which the '*triangular ligament of the urethra*,' the '*perineal aponeurosis*,' &c. are synonymous terms), is usually described as consisting of two layers of firm fibrous tissue, stretched across the triangular space which intervenes between the two rami of the pubic bones, including portions of the ascending rami of the ischium; the one corresponding with the anterior surfaces of those bones, and the other with the posterior, both being firmly united to and blended with their periosteum, thus defining an interval the depth of which from before backwards varies from about half to three-quarters of an inch. These layers are united at the apex to the sub pubic ligament, and their fibres interlace with the ligamentous connections of the pubic symphysis, before and behind respectively. The denser portion of the fasciæ may be considered as about an inch and a half, or a little more, in depth. At this point the two approach and coalesce, forming one structure, from which a thin fascial membrane descends posteriorly to cover the inferior or perineal surface of the levator ani muscle. The anterior layer is in contact in front with the muscles of the perineum, the erectors, accelerators and transverse, and beneath the last-named, after the junction of the layers already referred to, becomes continuous with the superficial fascia of the scrotum and abdomen, which dips down to join it, and is also united laterally to the pubic rami, so that a pouch is formed by which urine extravasated anteriorly to this layer of the deep fascia is prevented from passing backwards into the perineum, but finds its way upwards over the abdomen; being limited inferiorly in that situation, and prevented from descending upon the thighs, by the close connection which exists between the abdominal fascia and Poupart's ligament.

This deep perineal fascia is perforated by the urethra at about an inch below the pubic symphysis, although the distance varies from three-quarters to an inch and an eighth, according to measurements made by myself, a fact before referred to. The canal is in this situation nearly immovable; its parietes being intimately united to the fascia; for the fibrous covering of the corpus spongiosum forms a continuous structure with the anterior layer, while the posterior layer gives a prolongation backwards, continuous with the capsule of the prostate lying immediately behind it.

The aperture for the dorsal vein of the penis is about half an inch below the symphysis pubis; and near the bone on each side, the terminal branches of nerve and artery supplying the penis also perforate the anterior layer of the fascia. Between the two layers are contained the membranous portion of the urethra, the compressor muscles, the arteries of the bulb, the vessels and nerves already named, and Cowper's glands and their ducts. Thus far I have employed, in accordance with the prevailing custom, the term 'deep perineal fascia' to denote two layers of membrane which close in the pelvic outlet, in the situation of the pubic arch. But it is, strictly speaking, more correct in an anatomical point of view to employ this term to designate the anterior layer only, since the posterior layer is in truth more accurately described as a portion of the *pelvic* fascia, and it is now generally so regarded.

**2. Muscular Tissues, Voluntary and Involuntary.**—I shall notice first the involuntary muscular fibre, a continuation of that which enters into the structure of the bladder. The experience of practical surgeons had long ago led them to infer the existence of such fibres in or around the urethral canal. Hence we find the possession of vital contractility attributed to it by John Hunter,[1] whose observations of the healthy and morbid actions of the part alone led him to regard the urethra as undoubtedly containing muscular tissue in its composition.

Professor Kölliker of Würtzburg was perhaps the first to describe these fibres fully; this he did in the 'Zeitschrift für Wissen.,' Leipsic, 1848, in an article entitled 'Beiträge zur Kenntnis der glatten Muskeln,' as follows: Speaking of the muscular tissue, he says, 'Its relations are most complicated in the prostate gland and the prostatic portion of the urethra, which is rich in muscular fibres. So large is the quantity of this tissue in the gland itself, that the true glandular structure constitutes scarcely one-third or one-fourth of the whole. On removing the mucous membrane from the prostatic portion of the urethra, the yellow longitudinal fibres of the caput gallinaginis come first into view, which form the lower end of the trigone, and contain very few muscular fibres. On both sides of the caput gallinaginis, and extending to the anterior wall of the urethra, similar yellowish longitudinal fibres present themselves, and form a strong layer towards the neck of the bladder; but towards the membranous part of the urethra they gradually decrease to a very delicate layer. . . .

'In the membranous parts of the urethra the smooth muscular tissue is less developed. Under the mucous membrane, whose cellular tissue is remarkable for abundance of elastic fibres, there is a layer of longitudinal fibres which are connected with those of the prostatic portion. . . . External to these longitudinal fibres, there is a strong layer of transverse fibres, which belong, for the most part, to the *musculus urethralis*.

'The smooth muscular fibres are generally still less developed in the spongy portion of the urethra. In some cases they appear in exactly the same manner as the longitudinal fibres in the membranous portion; in other cases longitudinal fibres may be seen, but no muscular tissue can be found mingled with the cellular tissue and nucleus-fibres of which they consist. At a certain depth, however, some longitudinal fibres are distinguishable, with a more or less considerable admixture of smooth muscle. . . . One might consider this part as belonging to the corpus cavernosum urethræ, in which point of view we shall deny any muscular membrane to this region of the urethra; but it seems more natural to regard the whole corpus cavernosum as a highly developed muscular layer, provided with peculiar blood-vessels; for a large quantity of smooth muscular fibres, together with the cellular tissue, vessels, and nerves, entering into the structure of its beams and cords as far as the glans, render this body an eminently contractile structure.'[1]

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[1] 'The substance of the urethra is muscular, and is therefore capable of contracting its canal, similar to an intestine, so much so as to shut it up entirely. This makes it subject to diseases peculiar to muscle in general, which is indeed the only proof we have of its being muscular.'—*Hunter on the Venereal Disease* 3rd edition, p. 174.

More recently, Professor Ellis of University College has given, in the Med. Chir. Trans., the result of his investigations of these structures. He states that 'a submucous stratum of longitudinal fibres surrounds the urethra throughout its whole length, and is continued behind into the submucous layer of the bladder. It is strongest around the first third of the urethra (that next the bladder), especially so in the prostate, and becomes gradually thinner as it proceeds towards the end of the penis; much fibrous is intermingled with the muscular tissue. At the fore-part of the urethra its fibres end in tendons in the usual way, many of these blending with the submucous fibrous tissue.'[2] Professor Ellis recognises no circularly disposed fibres in the submucous layer of the urethra; when such are found in the membranous portion, external to the longitudinal fibres, he regards them as belonging to a system of circular fibres which are continuous with those of the prostate and neck of the bladder, and which are prolonged forwards as a very thin layer covering the urethra in the membranous portion, and intervening between the canal and the voluntary muscles forming the constrictor of that portion. The system of circular fibres referred to, he denominates the 'orbicularis urethræ;' for further description of which, see note, page 18. And lastly, where circular fibres are detected external to the longitudinal layer in the anterior part of the urethra, he refers them to the corpus spongiosum itself.

We now come to a consideration of the principal VOLUNTARY MUSCLES WHICH ACT UPON THE URETHRA.

These are the Levator ani, the Compressor or Constrictor urethræ, and the Accelerator urinæ; with the Transversus perinei, and the Erector penis, in a lesser degree.[3]

**The Levator Ani.**—This muscle, with its fellow, forms a contractile partition or floor for the entire cavity of the pelvis. Its relations to the neck of the bladder and prostate are important, and render its anatomical description necessary. Its origin commences anteriorly, from an oblique line on the posterior surface of the ramus of the pubic bone, close to the symphysis; and this part of the muscle, descending by the side of the prostate, to unite beneath that organ and the neck of the bladder in the central point of the perineum, with the corresponding part of the opposite muscle, and being separated from the remainder, by a small quantity of cellular tissue, has been recognised by some anatomists (Santorini and others) as an independent muscle, under the name of the '*levator or compressor prostatæ.*' Posterior to this, the fibres of the levator ani arise from a white line, seen within the pelvis running along the surface of the internal obturator muscle, as far as the spine of the ischium; which line indicates the point at which the pelvic fascia splits into obturator and recto-vesical fasciæ, from the inferior surface of which latter its fibres spring, as well as from the spine itself. From this extensive origin, the greater part converge to be inserted into the side of the rectum, and to interlace with its sphincters: those which are posterior uniting in a median raphé behind the anus, as far as to the coccyx, into the apex of which the last are inserted.

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[1] From an extract contained in the article, 'Urethra,' in the *Cyclopædia of Anatomy and Physiology*.

[2] *An Account of the Arrangement of the Muscular Substance in the Urinary and certain of the Generative Organs of the Human Body*, by G. V. Ellis, Prof. of Anat. in Univ. Coll. Lond. Vol. xxxix. p. 327.

[3] For *detailed* descriptions of the anatomical relations of these muscles, concerning which all anatomists are agreed, see any standard work on anatomy; it is also considered unnecessary to describe the smaller perineal muscles, recognised in works which systematically teach anatomy, since it is conceived that much space would thus be occupied without any corresponding advantage.

**The Compressor or Constrictor Urethræ.**—'Constrictor urethræ membranaceæ.' (Müller.) These names are given to a mass of voluntary muscular fibres, lying between the two layers of fascia already described as the 'deep perineal fascia.'

Mr. Guthrie, in his lectures at the Royal College of Surgeons, in 1830, and afterwards in his 'Anatomy and Diseases of the Urinary and Sexual Organs,' in 1836, gave a fuller description of this muscle, both in the male and female.

In 1836 Müller corroborated Mr. Guthrie's views, and, moreover, described a circular disposition of fibres around the tube, with which the others are continuous, which he called the 'stratum internum circulare.'[1]

But the muscle had been observed at a much earlier period, having been figured by Santorini, and that in a more correct manner than by Mr. Wilson, although an adequate description was wanting.[2]

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[1] J. Müller, *Ueber die organischen Nerven der erectilen männlichen Geschlechts-Organe*, &c.

Santorini, however, presented a careful drawing of the muscle in his work; although, from want of adequate description in the letter-press, his description was less accurate than that of Müller and Guthrie.

[2] In Table XV. of the *Septemdecim Tabulæ*, of Santorini, a posthumous work, fig. 3, letter F, there are clearly depicted both the upper and lower bundle of fibres, with the prostate lying behind, the views being made from the inside of the pelvis; and in fig. 4 of the same table is a delineation of the circular fibres described by Müller. The explanation of these at pages 170–1 is not by Santorini, but in the words of his editor, Michael Girardi, Professor of Anatomy at Parma.

These muscles are again figured in fig. 1, O O and i i, of the same table; the former letters showing the transverse, and the latter the circular fibres. The description is found under those letters, and also under letter L, pp. 167–8, of the work.

'*Io: Dom: Santorini—Anatom: summi septemdecim Tabulæ,*' &c. &c. Michael Girardi. Parmæ, 1775.

The voluntary muscular fibres which act directly on the membranous part of the urethra, described by the anatomists quoted, is now termed the 'compressor or constrictor urethræ.' It is regarded as comprising those fibres which arise from the pubic bone on each side of the posterior aspect of the deep perineal fascia, passing in a horizontal direction to unite with each other above and below the urethra, holding relations to it similar, but less in degree, to those which the internal part of the sphincter has to the extremity of the rectum. To this has been sometimes added a 'deep transverse muscle,' being no more than a parallel layer of fibres below the 'compressor,' which, however, may be taken to comprehend the whole of the muscular fibres intervening between the two layers of the deep fascia.

**The Accelerator Urinæ, or Ejaculator Seminis** (bulbo-cavernosus), is composed of two symmetrical halves, united by a median tendon, commencing at the central tendinous point in the perineum connecting it to the sphincter ani, the two transversus perinei muscles, and the anterior of the levator ani. The median tendon, corresponding with the raphé of the perineum, gives rise to fibres which pass horizontally outwards on either side to encircle the posterior two inches of the corpus spongiosum, including the bulbous portion, and unite in a fibrous expansion on its upper surface, i.e. between it and the two corpora cavernosa; while fibres anterior to these are prolonged over the last-named bodies also, and meet in a tendinous layer over the dorsal vessels of the penis.[1]

*The Erector Penis* and *the Transversus Perinei* need no special description, inasmuch as they contribute only in a slight and secondary degree to affect the condition of the urethra.

Having given a brief sketch of the muscles chiefly concerned in the functions of the genito-urinary apparatus, we shall now consider what influence muscular contraction exerts in performing them.

There has been some disagreement in the statements of physiologists respecting the special functions of the muscles which surround and act upon the urethra; and as it is important in relation to our subject to arrive at correct views respecting these functions, I have endeavoured to study them closely, and to present a brief statement in relation to them in the following conclusions.

That the URETHRA, in its natural condition, and when not in action, forms a shut passage, the membranous walls of which, for the most part disposed in folds, lie in close approximation to each other, and are so maintained by the agency of contractile structures around.

That the ACT OF MICTURITION requires for its proper performance a patent condition of the passage, and consequently the complete relaxation of certain muscles, forming a distinct group, viz. the anterior part of the levator ani (levator prostatæ), the compressor urethræ, the accelerator urinæ,[1] the transversus perinei, and the erectores penis.

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[1] Kobelt, *Die männlichen und weiblichen Wollustorgane*, 1844.

That this act is accomplished by the contractile power of the bladder itself, chiefly and primarily; the diaphragm and abdominal muscles co-operating to an extent which depends on the amount of force expended on its performance. The whole process in the healthy individual, in ordinary circumstances, always taking place in obedience to and under the control of the will.

That cessation of the act, whether occurring involuntarily, because the bladder is empty, or suddenly, by an act of the will, before complete evacuation has taken place, consists in the accurate closure of the neck of the bladder and urethral canal, through contraction of all the muscles forming the group described, which effort produces also, at the same instant, complete expulsion of the contents of the passage, which would otherwise leave it *guttatim*.

From these statements it may be concluded that the entire urethral canal, or, at all events, the membranous and spongy portions of it, can be contracted in calibre or closed by approximation of its sides, through the agency of muscular structures which surround it in obedience to an effort of the will.

That EMISSION OF THE SEMINAL FLUIDS, unlike to the act of micturition, is the result of a series of alternating, partial relaxations and strong contractions of the muscular components of the male organ; and is not the passage of a continuous stream through a flaccid tube, propelled by a muscular organ behind it; but is accomplished in the same manner that the last few drops of urine are expelled, viz. by the sudden approximation of the urethral walls anterior to the mouths of the seminal ducts, in addition to the muscular action which closes the neck of the bladder, and perhaps the contraction of the organic muscular fibres of the prostate itself.[2]

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[1] Hence the term 'accelerator urinæ' is a misnomer. The muscle is in a state which is the *reverse* of action during the process of micturition.

[2] Professor Ellis's dissections, above referred to, support the views here given of the functions of the muscular apparatus for the emission of urine and seminal fluid. Professor Ellis says, 'The prostate is essentially a muscular body, consisting of circular or orbicular fibres, with one large central hole for the passage of the urethra; and another smaller, oblique opening, directed upwards below the former, for the transmission of the common ejaculatory seminal ducts to the central urinary canal. . . . Its circular fibres are directly continuous behind, without any separation, with the circular fibres of the bladder; and in front a thin stratum, about one-thirtieth of an inch thick, is prolonged forwards from it around the membranous part of the urethra, so as to separate this tube from the surrounding voluntary constrictor muscle.' After giving further details, he continues: 'From the above-given anatomical facts, we may conclude that the prostate is less of a glandular than a muscular body, and is only a largely developed portion of the circular muscular layer that invests all the urethra behind the bulb or the

We may now, therefore, observe that contractions of the urethra may take place as the result of a reflex act, and of a nature differing from that of the contractions before described, which contribute to the performance of micturition. The latter act is due to the voluntary muscles; the former to those which are involuntary and unstriped; and it is therefore conceivable that each of these may occasionally, either singly or in combination, be the source of irregular action, when an unusual stimulus is present to interfere with their natural condition.

As a familiar example of the contractile power of the canal, it is only necessary to observe how forcibly a flexible bougie is sometimes expelled, so close is the contraction of the urethra upon the foreign body, even up to its last inch.

Again, everyone knows that the more gently a metallic sound is introduced, the more easily it traverses the canal; indeed the impetus of its own weight is often more than sufficient to accomplish this; but let unnecessary force be applied, and the muscular tissue, resenting it, creates a certain amount of obstruction. But especially when the irritant is of a chemical nature, as when an astringent solution is injected, or a piece of caustic is carried down the canal, great contractile power is exhibited, and the instrument is often so firmly grasped in the latter case as to require some little time and tact for its extraction.

Before leaving this subject it may be remarked that no very defined views on the specific function of *the neck* of the bladder, in relation to micturition, have been generally received by anatomists. The existence of a sphincter muscle there has been long a disputed point, and observers of equal celebrity may be found expressing opposite opinions on the subject. Some of these believe the closure of the viscus to depend on elastic tissue, which enters into its structure immediately behind the prostate. Others, and perhaps the majority, agree in considering the occlusion due to muscular action, but do not agree as to the agency by which it is effected. It is evident that both the circular and longitudinal muscular fibres are more abundant about the neck than in any other part of the bladder; the aggregation there of the longitudinal fibres being the necessary result of their convergence to one point. That some barrier to the flow of urine exists at the neck of the bladder cannot be doubted; and the form and position of the *uvula vesicæ* strongly suggest that this prominence must constitute a

spongy portion. . . . As the prostatic enlargement includes only part of the muscular stratum on the urethra, I would propose the name of *Orbicularis vel sphincter urethræ* for both the prostate and the prolongation around the membranous portion of the urethra; whilst I would confine the old term prostate (without the word gland) to the thickened and more powerful part near the neck of the bladder. . . . Its chief office' (i.e. of the orbicularis) 'will probably be to hurry on the semen, and deliver this into the grasp of the voluntary muscular fibres of the constrictor urethræ, which are external to it along the membranous part of the urethral tube.'—*Med.-Chir. Trans.* vol. xxxix. pp. 331–2.

chief part; since it need only be maintained in contact with the roof and sides of the outlet, in order to effect its closure. The performance of this action may perhaps be assigned to the levatores prostatæ, which appear to aid in maintaining the prostate, and with it the uvula, at the slight elevation required to close the passage, so that probably the act of micturition commences in the relaxation of those muscles to accomplish which the co-operation of other fibres may be necessary.

But at no great distance from the neck of the bladder appears an arrangement of muscular fibres around the urethra, the disposition of which strongly suggests that their function must be sphincteric, viz. those of the compressor urethræ. Indeed, there is not much doubt that the membranous part of the urethra is closed by its action in health, and that it deserves the title which has been accorded to it, viz. 'a sphincter of the urethra.' The slight obstruction often encountered at the membranous portion when an instrument is passed is sometimes due to this fact; and the little pain generally felt there arises from the opening of the passage by the bougie, and not from some irritable condition of the prostatic portion, to which it is frequently attributed. By no means denying that the prostatic portion may be unduly tender, I protest against the error of regarding a sensation of pain at this point, and a desire to make water, felt when an instrument arrives there, as proofs of morbid sensibility. These symptoms produced by the instrument have also been supposed to arise from its entry into the cavity of the bladder, but they are generally felt some time before the instrument has traversed the whole urethra. They are probably due to sympathetic contraction of the bladder and entire expulsory apparatus, from irritation of the sphincter of the urethra, by the presence of the instrument in the membranous portion, exciting the muscular action to expel the foreign body.

The consent which obtains among the actions relating to defæcation and micturition is worthy to be considered, as helping to indicate the offices of the muscles under consideration. In defæcation the first act permits the descent of the fæcal mass along the rectum; the levator ani, the sphincter ani, and that part of the gut containing the mass being relaxed; at the same moment there is a corresponding relaxation of the urinating apparatus, and the urine flows. The expulsive act is followed by contraction of the sphincter ani and elevation of the extremity of the gut, doubtless from contraction of the levator muscle also; and with it is associated a simultaneous contraction on the part of the urethral muscles, which instantly stops the stream; and among these muscles there can be little doubt that the anterior part of the levator raises the neck of the bladder, and that the compressor urethræ acts as a sphincter to the urinary outlet,[1] just as the sphincter ani does to the fæcal one. On the other hand, the act of stopping the stream of urine cannot be accomplished without some contraction of the sphincter ani, so intimately connected are the muscles which preside over the two outlets in the perineum. Thus we see that the act of defæcation cannot be performed separately from that of micturition, but the latter may be performed by itself alone. Nevertheless a process of a similar nature is always necessary for the accomplishment of either; a smaller degree of relaxation in the same set of muscles being sufficient to permit the urine to flow; a greater being required to perform defæcation in addition. So, when in consequence of great urethral obstruction considerable effort is required to expel the urine, evacuation of the bowels frequently occurs, in spite of efforts to prevent it.

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[1] The anterior border of the compressor muscle may be said to control the *true urinary outlet* in the male, as it does in the female; all that exists beyond it being,

3. **Erectile Tissue.**—It comes into relation with all that part of the urethra anterior to the deep perineal fascia, constituting the corpus spongiosum, though prolonged somewhat farther upon its inferior than on its superior aspect at that spot where, by its dilatation, the bulb is formed. A similar enlargement occurs at its other extremity, having an exactly opposite relation to the urethra, being placed chiefly above it to form the glans. Besides this, a thin layer of the erectile tissues passes backwards from the bulb, closely beneath the mucous membrane, and surrounds the urethra through the membranous portion, intermingling with the unstriped fibres already noticed, and is doubtless the source of the hæmorrhage which not unfrequently follows the use of instruments there. This vascular layer derived from the corpus spongiosum also sends an offshoot into the verumontanum, by means of which the latter possesses some amount of erectile function, and then anastomoses with the network of vessels around the neck of the bladder. It would be out of place here to describe minutely the erectile tissue itself, inasmuch as beyond the facts of its great vascularity nothing remains of importance in relation to stricture. So also it will be unnecessary to do more than name the corpora cavernosa, inasmuch as the only influence they can exert on the urethra is that of elongating it when they are charged with blood, and so producing a change in its direction.

There is a point, however, esteemed of some importance in connection with practice, relating to the internal structure of the corpus spongiosum in the situation of the bulb, which has to be noticed. Owing to the free inosculation of the vascular passages with each other, which appertains to that structure, incisions carried into it are liable to occasion considerable bleeding. But it has been alleged that the occurrence of this accident is rendered much less probable when such incisions are made strictly in the middle line, inasmuch as with

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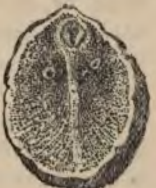
in fact, a male intromittent organ; so that the prolongation of the urethra is a ndition contingent upon the necessity which exists for the accomplishment of male sexual function.

such precautions a fibrous partition existing there receives the knife, and defends the vascular structures on either side. Most anatomical writers of the present day agree in affirming the presence of this partition. Kobelt described it in his work entitled 'Die männlichen und weiblichen Wollust-Organe,' in 1844, as formed by the dipping inwards, in the median line, of the fibrous envelope of the corpus spongiosum at its bulbous part, by which means a bilobed condition of that body is supposed to be formed. On the other hand, its existence has been wholly denied. I formerly made numerous transverse sections of the bulb, and can confirm the statement that a partition exists, which may sometimes be traced forwards to within two or three inches of the external meatus. It is distinctly seen, in some instances, to be composed of two layers with a faint dark line between them, indicating that the coherence of two bodies in the middle line, to form a single corpus spongiosum, is the typical formation, some traces of which were present in all the subjects examined. The relation of the partition to the fibrous covering of the bulb does not, however, appear to be connected with the external fibrous envelope, but to be chiefly developed in the interior of the bulb, immediately beneath and closely attached to the urethra, from which point it becomes less marked as it approaches to the circumference. Moreover, the posterior part of the bulb receives many more fibrous partitions or prolongations into its substance than any other part of the spongy body. See fig. 3, which shows one of these transverse sections of the bulbous part of the corpus spongiosum. Such sections, in all from fourteen bodies, which I examined in relation to this point, were sent by me as preparations to the Royal College of Surgeons in 1852. Since that time Professor Ellis has shown, in a Memoir before referred to—1st. That the envelopes of the corpora spongiosa and cavernosa are composed of organic muscular fibre. 2nd. That the median septum of the corpus spongiosum, although thicker in substance near to the urethra, reaches as far as to the external envelope, with which it may be demonstrated to be continuous, in the bulbous portion. ('Med.-Chir. Trans.' vol. xxxix.) It is therefore proved that this septum is not formed by a folding inwards of the outer envelope, as supposed by Kobelt. The description of Professor Ellis's dissections, and the plates which illustrate them, should be consulted in relation to this subject.

FIG. 3.



It would appear, then, that the relation of structure to the question of hæmorrhage stands nearly thus:

That the entry of the arterial branch of supply to the bulbous extremity of the corpus spongiosum, renders incisions at this point liable to become the cause of considerable hæmorrhage. That the existence of several fibrous partitions in the part posterior to the entrance of the artery, and especially one in the middle line, may possibly tend to render incisions into that part of the bulb so defended less productive of hæmorrhage than in parts where these do not exist.

But when the difficulty—it may be said impossibility—of hitting the exact line of this slight partition, as may be proved on the dead body, is taken into consideration, it cannot be seriously argued, I conceive, that the prevention of hæmorrhage depends upon the accomplishment of so delicate an operation. No doubt that the median line in sections of the bulb is the line of safety; and why? Because a short branch of the pudic enters each side of the bulb, and if an incision be made there, the artery might almost as well itself be opened. But if the section lie equidistant, or nearly so, from the two vessels, the minute meshes of erectile tissue intervening between the section and the artery may become plugged by coagula which thus conduce somewhat to the checking of hæmorrhage.

It is important to understand correctly the situation of the bulb in relation to the surface of the perineum, to the rectum, and other adjacent parts. In the ordinary dissection of the perineum, the distance at which it lies from the surface (which greatly varies at different points) is not seen, because in prosecuting it the structures are necessarily removed, layer by layer, until the bulb is reached. And its relation to the rectum is also incorrectly exhibited, because, after the dissection backwards of the flaps of integument, and, still further, after the removal of the muscles, and consequent division of the attachment of the sphincter ani, the rectum falls considerably from its natural position. In order to obviate these sources of error, I made some very careful dissections in order to ascertain the relations when undisturbed by the procedures just described, and I constructed the annexed diagram (fig. 4), which expresses those relations correctly. The same result is attained by the modern method of making sections of the frozen subject, but not more perfectly; I have examined this subject, because it is important in relation to operative proceedings often necessary, as will appear hereafter.

**Direction of the Adult Male Urethra.**—That portion which is surrounded by the corpus spongiosum is, as has been already stated, the most movable part of the canal; its anterior half at least, taking any direction (in the flaccid condition of the penis) which gravity or applied force may give it. As the urethra approaches the pubes, it becomes more fixed; the penis being here suspended by a ligament, and the crura or bases of the cavernous bodies which form it being attached to the pubic rami, while the bulb is closely connected to the deep perineal fascia. The canal now curves, to pass beneath the pubic symphysis, and will follow a course varying slightly in direction, according as it lies nearer to, or more distant from, that point: the extreme variation in adults, amounting to about a quarter of an inch;

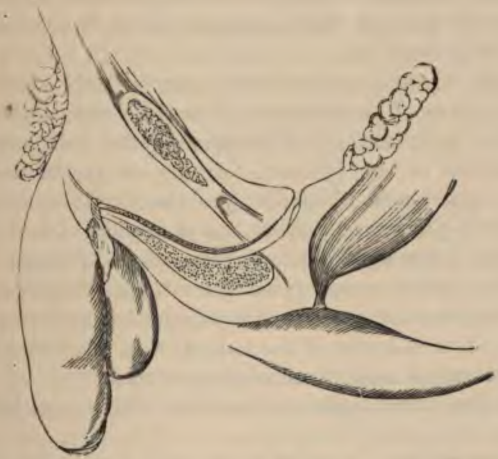
that is to say, the urethra perforates the fascia, below the pubic arch, at a distance which varies in different subjects from seven-eighths of an inch to one inch and an eighth.

THE MEMBRANOUS PORTION, in the erect position of the body, ascends with a slight curve, which direction is continued through the prostate, until at last the course of the urethra into the bladder is almost vertically upwards.

The practical points to be noted in relation to the direction of the urethra, are:

FIRST: that the lowest part of the passage in the upright position of the body is that part which is in contact with the anterior layer of the deep perineal fascia; and that the floor at this point forms, to some extent, a fulcrum upon which a solid instrument turns, when its handle is depressed for the purpose of carrying the point onwards into the bladder.

FIG. 4.



SECONDLY: respecting the influence of the layers of fascia, by their contact with the urethra, the anterior layer exerts the larger share, in stopping the progress of an instrument; indeed the posterior layer, from the contiguity of the prostate, can scarcely be supposed ever to become an obstacle. The bulbous portion, which has already been demonstrated to possess considerable dilatability (page 4), being immediately in front of the anterior layer, permits more freedom of motion in the point of a sound here than elsewhere, while the unyielding fibrous tissue around the commencement of the membranous part suddenly limits it. Hence this is a point at which the progress of the instrument is sometimes more or less arrested, even when no stricture exists, although the slightest management is usually sufficient to overcome the difficulty. Moreover, the membranous portion is more completely closed than any other part, by the action of the compressor urethræ muscle. But if organic contraction of the canal exist here, or a little anterior to it, which is the more common site, it is easy to understand how readily any misdirected force, when perseveringly applied, may lead, if not at once to false passage, yet to an indented or sacculated condition of the urethra in front of the stricture, greatly increasing the difficulty of guiding the instrument through it, and facilitating the production of a false passage at some future attempt.[1]

THIRDLY: That the urethra follows a curved course beneath the pubic symphysis, and in so doing describes the arc of a circle, whose diameter depends somewhat upon the operation of certain causes which influence its direction. It follows, therefore, that the curves of solid instruments employed to traverse it may advantageously vary also. Nevertheless, it may be desirable to ascertain what is the prevalent curve, that it may be made the basis upon which to construct metallic instruments for general use.

Mr. Briggs, whose inquiries have been already alluded to, has described the curve of an average and well-formed urethra as 'commencing at one inch and a half anterior to the bulb, and from this to its termination in the bladder, forming an arc of a circle three inches and a quarter in diameter; the chord of the arc being two inches and three-quarters, or rather less than one-third of the circumference.' Many years ago I made a series of observations in relation to this question, which corroborated the estimate above given. Fig. 4 presents a diagram already referred to which indicates the curve, and in fig. 15 the curve is drawn of the natural size, together with the outline of an instrument made to correspond with it.

There are some circumstances, however, which may influence this direction.

Thus, in spare men, of small frame, the general development, as well as the size of the genital organs, being below the average, the curve of the canal appears sometimes to be more acute, and it is then desirable to increase that of the instrument to be employed, in order to facilitate its introduction. But in large and in corpulent subjects, as a rule, the angle which the plane of the bulbous portion forms with that of the prostatic part is more obtuse, the course of the urethra describing an arc of a circle larger than that met with in the preceding class. There are other circumstances which render desirable the employment of an instrument which is more curved than that which is required by the healthy adult male; such as the presence of hypertrophied prostate, or tumour arising therefrom. Very rarely indeed, the neck of the bladder is raised above the ordinary level from other causes. Lastly; the more elevated position of the bladder behind the pubes in children, renders the use of such well-curved instruments always necessary for them.

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[1] Preparation No. 2,536, among others, in the Museum of the Royal Colleg of Surgeons, illustrates these remarks.

The normal direction of the urethra may be interfered with by certain morbid conditions of neighbouring parts. Thus, deformity of either corpus cavernosum from contraction of lymph effused into its substance, may distort the passage by deflecting it to either side. Prostatic enlargement has been alluded to; hypertrophy of the median portion or 'third lobe' has been seen to occasion a channel on either side, thus dividing the canal in two. Abscesses, tumours in the course of the canal, most frequently within the pelvis, which may be malignant, hydatid, &c.; scrotal herniæ of large size, and hydrocele, may all occasion some deviation from the usual direction.

LASTLY: it may not be forgotten, that while the course which the urethra naturally describes is thus curved, a straight instrument may be passed with perfect ease without inflicting any injury upon the canal. The curve is in this case obliterated, by using the portion of the urethra which is anterior, as a fulcrum, by which to carry the point closely along the roof of the canal throughout its course. At the same time more pressure is necessary than that required to introduce a curved instrument.

The following inferences are stated in the form of propositions, and are deduced from a consideration of the facts cited in the foregoing pages, as a digest of the anatomy and physiology of the organs in question, as far as these bear relation to the subject, and for the sake of presenting a clear and perspicuous view of it before entering on the next section.

1. That the urethra is composed of a delicate and sensitive mucous membrane, exceedingly vascular, and well supplied with nerves, the area of which is increased by numerous small glands and follicles; and that it is closely connected by its sub-mucous areolar tissue with involuntary muscular fibre in every part of its course, the distribution of which is not quite equal in quantity throughout.

2. That in the prostatic and in the spongy portions of the urethra, the glandular and erectile structures respectively, which lie next in order to the above-mentioned contractile tissues (proceeding from within outwards), are associated with a large proportion of involuntary muscular fibres, which, while they act by evacuating, in either case, the contents of the organ—in the one, a glandular secretion, in the other, the blood supplied for erection, may also temporarily diminish the calibre of the urethra.

3. That in the membranous portion, there is also close contact of voluntary muscle, the function of which is to close the canal at this

point; the sphincteric character of the muscle being strongly indicated by its structure, as well as by what we infer respecting its actions, both natural and morbid.

4. That not only does vascular or erectile tissue surround the whole of the spongy part of the urethra, but that a thin layer of it encircles the membranous portion also, and that from the peculiar structure and function of this tissue, laceration or division of it may be attended with considerable loss of blood.

5. That while the prostatic part is movable to a small extent in a direction upwards and downwards, in obedience to muscular action, the membranous is nearly fixed and constant in position, from the relations to it of the deep perineal fasciæ; and that the anterior part of the spongy portion is movable in any direction, the bulbous portion being less so in the ratio of its proximity to the anterior layer of the fascia and membranous urethra contained therein.

# CHAPTER II.

## CLASSIFICATION AND PATHOLOGY OF STRICTURES OF THE URETHRA.

WHAT IS A STRICTURE?

Stricture may be defined as an abnormal organic contraction of some portion of the urethral canal.

Numerous definitions have been offered by various writers, but all, with few exceptions, convey almost the same idea and the same extent of meaning.

Among these, Sir Charles Bell's may be noticed as one of the chief. Rightly assuming the urethra to be in its quiescent state *a closed* canal, he defined stricture to be that condition in which it had 'lost the power of dilating.' No objection can be offered to the adoption of this definition. The urethral walls lie in contact; their closely applied folds are well seen when a transverse section is made; and if these are prevented by disease at any point from unfolding or separating, although strictly speaking the canal has 'lost the power of dilating,' it is more convenient, perhaps, to speak of it as 'contracted' at that spot.

Contractions of the urethra have been usually regarded as divided into two classes. They are said to possess a natural tendency either to be PERMANENT or to be TRANSITORY in regard of duration.

A PERMANENT CONTRACTION is due to organic deposit in or around the walls of the urethra, and has no tendency to disappear by any natural action or function of the body; accordingly it is termed organic or permanent stricture.

A TRANSITORY CONTRACTION may be caused by local vascular inflammation or congestion, causing temporary narrowing of some part of the urethra, hence 'inflammatory or congestive stricture' is sometimes spoken of; or may be due to unwonted muscular action of the voluntary or of the involuntary fibres, in which case it has been designated 'spasmodic stricture.'

Owing to the occasional occurrence of some spasm, or of inflammatory thickening complicating an organic stricture, and also to the fact that inflammation alone sometimes causes retention of urine, the views held with regard to the varieties of stricture and to their classification are somewhat obscure. Thus some authors have proposed to distinguish no less than seven varieties of stricture, others only two or three, while certain writers have not entertained any methodical distinction at all.

John Hunter recognised three varieties, viz. 'permanent,' 'true spasmodic,' and 'mixed, composed of a permanent stricture and spasm.' He further remarks: 'There are very few strictures that are not more or less attended with spasms.' And this arrangement leaves one cause of obstruction unrecognised, viz. acute inflammation. As we shall soon see, there are certain states of the urethra in which an attack of inflammation may suddenly occlude the canal, and cause retention of urine, the mechanical cause being undoubtedly congestion of the vessels, and the outpouring of inflammatory products into the tissues around.

Sir A. Cooper says, 'Strictures are of three kinds, the permanent, spasmodic, and inflammatory. The permanent stricture is the result of thickening of the urethra from chronic inflammation; the spasmodic arises either from a contraction of the muscles surrounding the urethra, or from the urethra itself; the inflammatory in consequence of inflammation of the acute kind, which generally succeeds the acute gonorrhœa.'

Now this inflamed condition ought not to be described by the word 'stricture' at all. The obstruction in question is occasioned by a general swelling of the prostate gland, and not by a limited contraction of any defined spot in the course of the canal. The condition very much resembles inflammation of the tonsils, and we never speak of the obstruction which this offers to deglutition as stricture of the throat, but reserve the word to describe some permanent organic narrowing of that region. I shall therefore not adopt the term 'inflammatory stricture' in this work.

Instances of retention of urine in the male, or of well-defined narrowing in any portion of the urethra, due solely to spasm of its muscular parietes, are without doubt very rare; still the influence of muscular action upon the urethra being unquestionable, it is necessary to recognise it in diseased conditions of the organ, since it may sometimes complicate any of them. Indeed, an organic narrowing of the urethra can be well imagined to be influenced at some time or another by undue action in the muscular tissues around.

Still I am quite satisfied that there is no warrant in fact for admitting that stricture of the urethra may be due to muscular action alone, and I shall therefore decline to employ the term 'spasmodic stricture.'

I recognise then but one morbid condition as 'stricture,' viz. that organic or permanent change in the walls of the urethra which narrows them, or prevents their opening or dilating to the natural calibre. The pathology of this condition is to be sought by examining diseased structures in the dead body as well as by studying the living. It forms an important portion of the subject, is more susceptible than any other of accurate illustration, affords a basis for action in relation to treatment, and will occupy a large share of attention in the pages before us.

Happily in this country we have ample, indeed, unrivalled means, for the anatomical examination of the subject. The Museum of the Royal College of Surgeons is rich in preparations, and as these are more generally accessible to the majority of readers than any other collection, special reference will be made to examples by their numbers in the catalogue, for extracts from which see Appendix. Specimens in other Museums will be also referred to, when required for purposes of illustration. In short, the pathological anatomy of organic stricture, detailed in the following pages, is to be regarded as, in a great measure, deduced from a personal examination of more than three hundred preparations of stricture in the Museums of this country, and of a number almost equal, of preparations of the bladder, kidney, &c., which illustrate concomitant morbid conditions, in addition to the observation of numerous recent specimens by autopsy.

**Varieties of Forms.**—*Linear Stricture.*—The urethral canal may be obstructed by a thin membranous diaphragm only, stretched across it, with an aperture centrally or laterally placed, having an appearance, in relation to the rest of the passage, somewhat resembling that which the pyloric orifice of the stomach bears to the adjacent duodenum.[1] A fold of the mucous membrane may obstruct the passage on one of its sides only; and this may occur above, below, or on either side, forming a crescentic septum, obstructing a segment of the calibre of the canal. Similar folds sometimes run obliquely instead of directly across it: all may be included under the name linear contraction. This condition was called 'bridle stricture' by Sir Charles Bell, a term alluded to here because some writers on stricture have supposed it to denote exclusively those rare instances in which a free band of lymph

[1] An excellent example is No. 2,528, Royal College of Surgeons.

runs across the urethra from one side to the other, as if adhesion between opposite walls had occurred to a limited extent, and had afterwards gradually suffered extension, a misconception of that author's meaning. Such free bands, however, do exist.[1] A remarkable specimen, in which ten or eleven are found in one urethra, is preserved in the Museum of St. Bartholomew's Hospital. It is not improbable that these are sometimes formed by the passage of instruments, and that they are, in fact, short 'false passages.' The appearance of one or two of those in the preparation referred to, gives this impression very strongly. It is very common to find that part of the urethra which lies behind a confirmed stricture more rugose than natural, especially in the membranous and prostatic portions; preparations may be seen in which it even appears fasciculated. These bundles may be readily detached with a small instrument, and this cause is suggested as an explanation of some (it is not said of all) of these cases.

*Annular Stricture.*—Those instances in which the contracted part is a little thicker and broader than the foregoing description includes, have been termed 'annular' strictures; examples of which present an appearance as if a piece of cord had been tied round the canal at one point, leaving the remainder free. Excellent illustrations of this are referred to below;[2] and a good instance is seen at fig. 5, page 38.

*Indurated Annular Stricture.*—In most cases of confirmed stricture, the induration is seen to extend into the tissues around the urethra, to the depth of a line or more; but is nevertheless limited in extent from before backwards, to a space occupying less than half an inch of the canal. The centre of the space is the point at which the contraction is most considerable, so that the affected portion presents a form somewhat resembling that of an hour-glass: and it is worthy of remark that the induration is generally thicker at the floor than on the upper aspect of the urethra. Such may be regarded as 'indurated annular' strictures.

*Irregular or Tortuous Strictures.*—In a few instances, some of the natural rugæ of the urethra seem to be adherent, or even fused together for the space of a few lines in length. But occasionally this occurs for a considerable distance, and the canal is narrowed, and its walls thickened on all sides, for a length of one or more inches.[3] In these cases the induration extends deeply into the surrounding tissues, involving sometimes the entire substance of the corpus spongiosum, and giving rise to some of the most obstinate and undilatable strictures. Fig. 6, at page 38, represents such a case. In other instances, the urethra is irregularly contracted throughout almost its entire course; and every degree of variation is to be met with, between the condition in which the only obstacle within it is a small fold of mucous membrane, and that in which almost its whole length is more or less affected. In very rare cases something resembling a cicatrix may be seen in the form of a patch of indurated tissue, around which the mucous membrane is puckered, in lines more or less radiating from it; the amount of contraction appearing to correspond with the extent of previous loss of substance from some cause or another.

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[1] Specimens of these *free bands* may be found in St. George's Hospital Museum, No. S. 2. Bartholomew's Museum, Series xxx. No. 37, and Series xxvii. No. 28, the case referred to in the text. St. Thomas's Museum, D D, Nos. 7, 9, and 10. Royal College, Edinburgh, Nos. 2,096, xxxii. D, and 2,132 and 36, xxxii. F.

[2] Royal College of Surgeons, Nos. 2,529, 2,537, 2,539, 2,540.

[3] Royal College of Surgeons, Nos. 2,557, 2,552, 2,535-6. Middlesex Museum, xi. No. 10. Bartholomew's, Series xxvii. No. 28. Royal College, Edinburgh, Nos. 2,108-9, xxxii. D.

**Number in one Urethra.**—Occasionally several separate strictures may be observed in the same subject. John Hunter records an instance in which he met with *six* strictures in one urethra. Lallemand mentions one with *seven*; Colot saw one with *eight*; Ducamp says there are rarely more than two, but that he has seen *four* or *five*. Boyer thought *three* could exist together. A case is reported by Leroy D'Etiolles, in which he found *eleven*; but since this is sometimes quoted as if it were a post-mortem observation, it is necessary to state that this number rests on the evidence afforded by the passage of a flexible bulbous-ended exploring instrument on the person of a living patient. The strictures, to use the author's words, were 'for the most part in the spongy portion, about two and a quarter lines distant from one another,' a condition which would perhaps be better described as a series of irregular contractions, than by any statement of the exact number of the strictures. Rokitansky speaks of four, and does not record a higher number as having come under his own personal observation.

My own experience does not lead me to recognise numerous independent strictures in one urethra. Three, or at the most four, distinct contractions is the highest number I have been able to admit, and the last-named instances are very rare. I by no means say that there is any difficulty in counting a larger number of points, at which a bulbous-ended instrument may be perceptibly checked in withdrawing it from the membranous portion of the urethra outwards to the meatus. But I contend that for all practical purposes during life, two, or at the most three, chief points of narrowing, beyond and besides the meatus, are all that practically need be recognised. Nor shall we discover any greater number when the urethra is slit up after death. A few examples of urethra greatly contracted, from the meatus externus almost to the membranous portion, are in existence; but these do not exhibit a multiplicity of strictures so much as general thickening of the whole canal.

The following questions are now presented for solution:

What are the essential anatomical elements of organic stricture? And what are the structures in which the constriction itself is seated?

**Elements and Seat.**—Their consideration may be advantageously entered upon together. The first effect of inflammation upon the mucous membrane is a swelling or thickening of it, caused by engorgement of the vessels. Then exudation of an albuminous fluid takes place into its substance, and into the tissues beneath, a fluid which may become absorbed under favourable circumstances. But when the morbid action persists, the effused material becomes organised, forming a firm fibrous tissue around the canal, causing adhesion between the mucous membrane and the submucous tissue, infiltrating the meshes of the latter, sometimes involving the substance of the corpus spongiosum itself; while repeated or long-continued attacks of inflammation may implicate the entire thickness of that body, rendering it tough and dense throughout. Sir Charles Bell describes the strictured part in one of his preparations (now in the Museum of the College of Surgeons, Edinburgh, 2,169, xxxii. G), as being 'as hard as a board.'

On laying open a strictured urethra after death, we shall accordingly discover that the structure in which the constriction itself is seated is not always the same. It may in rare cases be almost confined to the mucous membrane of the urethra, which appears to be simply thickened, a condition which may be regarded as the primary and elementary form of stricture; such a narrowing usually disappears when section is made, leaving perhaps only a faint whitish line or two by which to indicate its situation.[1] There is no marked redness of the membrane or congestion of its vessels to be observed when anatomical examination is made. The mucous membrane is seen to have lost its transparency and polish, or to be thickened, indurated, or puckered; and on making a section of the strictured part, but very slight implication of the deeper tissues may be evident. There is, however, more or less adhesion between the mucous membrane and the parts beneath.

Very often a few transverse bands of whitish fibres are seen beneath the mucous membrane, encircling the urethra and narrowing it as if it were tied with thread. When these are cut, the mucous membrane is more or less set free; hence it is that a stricture which has been exceedingly narrow during life is often less obvious to the eye when the urethra is laid open after death than would have been anticipated. The mucous membrane at the constricted point appears narrower than elsewhere, but much less so than would be inferred from the small calibre existing before the section of the urethral wall; and in a few instances the membrane appears scarcely to have been altered in structure, and merely confined by the bands described.

In more severe cases the meshes of the submucous cellular tissue are filled with organised deposit, the presence of which destroys elasticity and mobility, implicates the involuntary muscular fibres, which can no longer be traced, and extends to the proper fibrous coat of the spongy body. In the worst examples, the deposit solidifies the erectile tissue itself, and constitutes the hard and unyielding mass already described. This condition is frequently apparent to the finger, when external examination is made in the course of the urethra during life, a nodular mass being distinguished surrounding it, in the situation of the stricture, so firm and resistant to the touch as to have suggested the word 'cartilaginous' to designate the formation.[1] The same condition may occasionally be found affecting also the corpora cavernosa, when the whole body of the penis presents a hard, gristly, and knotted feel, and a deformed appearance when erect.

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[1] Museum of College of Surgeons, No. 2,528.

On examining the tissues which compose the stricture under the microscope, we find the same materials as are presented by infiltration elsewhere produced by the inflammatory process, forming a structure which consolidates, and contracts with age, but never disappears spontaneously. The same interstitial deposit is found in that condensation of the lung often observed to follow the contraction of lymph poured out upon its surface in pleuritic inflammation; and although formed under differing circumstances, it may be recognised in the cicatrices following burns, the contractile tendencies of which are familiar to all. It is interesting to observe that by making sections of stricture for microscopic examination, the sub-mucous tissues below the urethra are more deeply affected by deposit than those which are above.[2]

**False Membranes obstructing the Urethra.**—A widely differing condition to any of those above described has been referred to by some under the title of stricture. Sometimes, but very rarely, an exudation-deposit upon the surface of the urethral mucous membrane causes occlusion of the canal. Very few instances of this are on record, and very few examples are to be found in our Museums. Rokitansky refers to them as follows: 'In very rare cases we find primary croup occurring on the urethral mucous membranes; it induces a circumscribed or a tabular exudation, according to the intensity of the process, and occurs chiefly in children.'[3]

Mr. Hancock recorded two or three instances. He described them as consisting of delicate false membrane, possessing the characters of condensed cellular tissue, closely adhering to the surface of the mucous membrane, for perhaps an inch in length, sometimes requiring the aid of the microscope for its identification; and he moreover described three examples in which the posterior part of the deposit was loose, raised, as it might be supposed, by long-continued pressure of the urine upon it in micturition, until it had come to form a kind of semilunar valve, with its free border towards the bladder: an obstacle which it is easy to conceive might form a hindrance to the flow of urine, and one which would act with greater power in proportion to the amount of fluid pressure exerted upon it from behind. A preparation exhibiting a faint resemblance to the condition described is to be found in Guy's Hospital Museum, No. 2,402$^{10}$. There is another in the Musée Dupuytren of Paris. It bears Breschet's name, and is represented as a case of urinary retention depending on a '*valvule sigmoïde*,' situated about the bulbous part of the urethra. This was doubtless correct, but the preparation is old now, and does not exhibit the condition well. One other which has such claim to belong to this category is a preparation of Sir Charles Bell's from a patient who died of extravasation. It now forms No. 2,160, xxxii. G, of the Museum of the College of Surgeons, Edinburgh. But both in the first and last preparation referred to, the valve possesses, in my opinion, more the appearance of a dilated lacuna than that of a flap of false membrane.

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[1] University College Museum, No. 815. Museum of Royal College of Surgeons, Edinburgh, No. 2,114, xxxii. E.

[2] *Atlas des Mal. des Voies Urin.* Guyon & Bazy. Paris, 1881. Livre III. Pl. 27, figs. 1 & 2.

[3] *Rokitansky*, translated for the Sydenham Society, vol. ii. p. 235.

Sir Charles Bell recognised the formation of deposits upon the surface of the urethra as the result of inflammation occurring 'as a consequence of stricture,' observing that 'the stricture itself not only increases, but the passage is apt to be further choked by a crust of a coagulable lymph which is deposited behind the stricture,' and states that it 'will become consolidated, apparently by successive attacks of inflammation there.'[1] This condition is not unfrequently present, and may be seen by reference to several specimens of old stricture, in which such deposits are very obvious, in the dilated part of the urethra behind the obstruction.[2] This, however, it will be readily understood, is not to be confounded with a croupal exudation from the urethra, and which I still believe to be extremely rare.

The opinion thus expressed in 1852, in the first edition, has been confirmed by numerous observations which I have made since it was originally given; and I have had the satisfaction of finding it corroborated by the independent labours of another observer. M. Alphonse Guérin, chirurgien du Bureau central in Paris, carefully examined 100 cases of diseased urethra after death, of which number about half were affected with stricture, and recorded his experience in a memoir on the subject. He asserts that he has never seen 'the slightest trace of granulating tissue upon the surface of the mucous membrane: the plastic process has acted either immediately beneath the mucous membrane, or in the spongy tissue of the canal.' He adds, 'that in none of the numerous cases which he has examined has he found *any false membrane on the free surface* of the mucous membrane.'[1] The italics are those of the author himself.

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[1] *Treatise on the Diseases of the Urethra*, &c. 3rd edition, 1822, p. 109.

[2] Royal College of Surgeons, No. 2,576. St. Thomas's Museum, D D, No. 16. University College Museum, Nos. 815, 2,185, 2,425.

From all the foregoing it must, I think, be inferred that the condition referred to is excessively rare.

**Degree of Contraction—Impermeability.**—Speaking in general terms, the degree of contraction is proportioned to the extent of the inflammatory action which has existed in the tissues around, although, it may be remarked, the severity of the symptoms is not always, by any means, commensurate with the degree of narrowing which exists. It is very rare indeed to find the urethra altogether impervious during life. However contracted it may be, the urine still issues either in a very small stream, or by drops. Retention does not depend on absolute organic impermeability. It is easy to conceive that when the canal is contracted to a mere pin-hole, the slightest cause may operate to occasion a temporary total obstruction; a little tumefaction of the part, a pellet of thick mucus, a flake of fibrinous deposit, or a very small calculus, is quite sufficient to block the channel; and fatal consequences have been so caused.

But do the walls of the contracted passage ever adhere, and so cause obliteration of the urethra?—Never, unless fistula has been established, and then, although very rarely, a portion of the canal which is anterior to the unnatural opening, has been known to close by adhesion and cicatrisation.

Nevertheless, obliteration of the urethral canal does occur, but it is almost invariably of traumatic origin. The urethra may be cut across by a wound in the perineum, and for want of proper attention the urine may pass entirely through the artificial opening, after which the proper passage may soon adhere and close. But such obliteration is a wholly different thing from stricture, and ought not to be confounded with it. Its occurrence is by no means uncommon.[2]

I have occasionally examined in the dead-house an example of stricture, which was impermeable to the smallest eye-probe, even after the urethra had been slit up to the point of contraction; urinary fistulæ were present. The preparation of one case was in a private collection in this city. Another occurred in 1855, in my own practice; in this instance almost no urine had passed for years, except by numerous fistulæ. At the autopsy, although there was not absolute occlusion or obliteration, a probe of the smallest size could not be passed through the stricture, and I had been obliged to puncture the bladder three months before death.

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[1] *Des Rétrécissements du Canal de l'Urètre, par le Dr. A. Guérin. Mémoires de la Société de Chirurgie de Paris.* May 1854, pp. 122 and 129.

[2] A case of obliterated urethra, from injury, was exhibited by me at the Pathological Society in 1853. See *Trans.* vol. v. p. 212.

See also, Guy's, Nos. 2,412$^{63}$, 2,405, and 2,409. College of Surgeons, Edinburgh, No. 2,139, xxxii. F.

We shall next notice in detail, the various changes which arise in the genito-urinary apparatus, as the results of organic urethral obstruction.

**Hypertrophy of the Bladder.**—One of the first results of permanent obstruction in the urethra is hypertrophy of the substance of the urinary bladder, proportioned in amount to the power required to propel the urine through the narrowed channel. Perhaps, antecedently to this, a small amount of dilatation takes place; the ordinary efforts of the viscus being insufficient to accomplish the act of micturition, some of its newly exerted force tells upon its own walls and dilates them. But the muscular fibres soon become greatly augmented—the coats of the bladder are thickened—and in time numerous columnæ are seen interlacing in all directions, somewhat resembling the musculi pectinati of the right auricle, or the interior of the left ventricle of the heart. Preparations are common in which the coats of the bladder measure from half to three-quarters of an inch in thickness, and some even amount to one inch in places.[1] This chiefly depends on hypertrophy of the muscular fibres, although the same condition extends also to the areolar tissue which unites them, while there is thickening of the mucous membrane also when much inflammation of the last-named structure has long existed.

**Sacculi of Bladder.**—As a consequence of the fasciculated arrangement which the fibres acquire, interstices of varying size are observed between the bundles. These depressions, which are sometimes very numerous, become deeper, and the mucous membrane being driven in by the fluid pressure which is exerted upon them, is apt, in course of time, to form pouches, which are sometimes of considerable size. One of these, after long-continued dilatation, may at length form a receptacle for the urine, having a capacity as great or even greater than that of the original bladder. I exhibited at the Pathological Society, in 1854–5, such a sac capable of holding two or three ounces, the patient's age being only forty-two, which resulted from severe and unrelieved stricture. In another case, age sixty-seven, besides a large sac there were no less than fourteen smaller ones, varying in size between that of a pea and a marble.[2] As a rule, the 'sac' thus formed is much thinner than the bladder, being composed of the mucous membrane only, over which are irregularly distributed some muscular fibres and areolar tissue. Hence, rupture has been known to take place, attended, of course, with rapidly fatal results. A preparation illustrating this condition is No. S. 21, at St. George's

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[1] Such preparations are common in every Museum. For examples of the extreme cases referred to, see the following: Bartholomew's Hospital, Series xxx. No. 11. St. Thomas's B B, No. 10. Guy's, No. 2,412$^{50}$. Edinburgh College of Surgeons, No. 2,021, xxxi. G.

[2] *Trans.* vol. vii. p. 248, and vol. vi. p. 246.

Museum.[1] In some of these pouches it is not rare to find a collection of calculous matter, and in this manner are sometimes formed encysted calculi which elude the sound.

**Results of Inflammation.**—Meantime, changes are going on in the character of the mucous membrane. Thus after death it is thicker, presents a soft velvety or pulpy feel: its colour is heightened, or it assumes a dark or dirty red in place of the natural light yellowish pink. The free surface of the projecting columns or rugæ often exhibits a fine crimson hue, while the lateral parts of those projections which lie in contact are free from the tint. In other examples circumscribed spots appear, which are more congested than the rest; and in places the mucous membrane may be abraded and preternaturally softened. Lymph is frequently deposited upon it, and adheres to its whole surface, whence it may be separated in a mass, or in patches of variable thickness; an entire cast of the bladder may thus be formed, and even exfoliated.[2] More generally in severe and old cases, almost the whole lining presents a dusky greyish hue, indicative of the chronic inflammation which has subsisted. Frequently a quantity of thick, tenacious, dark-coloured mucus adheres closely to the whole surface, and sometimes much fine calculous matter is mingled with it.[3] After death by extravasation of urine, in some of the worst cases, large gangrenous spots of the membrane are seen of a greenish and blackish hue.

**Capacity of the Bladder.**—The capacity of the bladder may be either greatly diminished or increased. Instances of the former kind are not wanting, in which half or, at most, an ounce of fluid must have filled the organ. After long-continued irritation from various causes and great frequency of micturition, the bladder, never in any degree distended by its contents, has become permanently contracted, the coats being thickened by repeated inflammation and deposit. In other cases, the power of the bladder to retain urine has not been diminished, so that the secretion has accumulated, and the reservoir having become permanently dilated, a portion only of the contents are expelled at each act of micturition. In this case, hypertrophy of the walls may co-exist also. These results, however, are not so commonly seen in patients who suffer from stricture, as in those whose retention arises from enlargement of the prostate.

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[1] Preparations abound illustrative of these changes. Among the best and the most instructive are, Museum of the Royal College of Surgeons, No. 1,983. Museum of Guy's, Nos. $2{,}087^{50}$, $2{,}087^{75}$, 2,089. Museum of King's, No. 915. Museum of University College, No. 1,063, one of the most remarkable specimens extant. Museum of St. George's, No. S. 50, 51, 52, 70. S. 21 is interesting, from death having been occasioned by the bursting of one of these sacculi into the peritoneal cavity. Museum of Bartholomew's, Series xxvii. Nos. 10, 28, 33. Museum of London Hospital, E. d. 47. Museum of St. Thomas's D D, No. 4. Museum of Edinburgh College of Surgeons, xxxii. B, Nos. 2,051, 2,054, and 2,074.

[2] Bartholomew's, Series xxx. No. 12, and others.

[3] Royal College of Surgeons, No. 2,557 Guy's Hospital Museum, No. $2{,}091^{0}$

**Effect on Ureters and Kidneys.**—The process of dilatation, resulting in part from pressure, is not limited to the bladder alone; the ureters are soon distended, and little by little these tubes, which in health are about the size of a straw, grow more and more capacious, and may even become supplementary reservoirs for the secretion of the kidneys. They may be met with at any size, up to that of a man's thumb: and in very rare instances have been seen twice as large, and convoluted like an intestine. At the same time, their parietes sometimes increase in thickness, although this is not invariably the case. Then the pelvis and calices of the kidneys themselves are capable of suffering distension to an enormous degree; little by little the papillæ disappear, as the calices expand under the dilating influence of the accumulating fluid, until a capacious receptacle for it is formed. I have seen twenty ounces of urine evacuated from one; this, however, is a very unusual degree of capacity. A fourth or a third of that quantity is by no means unfrequently found. But in a case which I presented to the Pathological Society in 1853, the distended pelvis of the right kidney measured seven inches in its greatest diameter, and the corresponding ureter two and a half inches.[1]

The pressure thus exerted upon the kidney tells sooner or later on the secreting substance of the organ, which becomes atrophied in consequence, and is reduced in thickness by degrees, until at length it totally disappears, and all that remains is a membranous sac.[2]

**Expansion of Urethra.**—A very constant effect of this same pressure is expansion of all that part which lies behind the stricture; and when the obstruction has existed for a considerable time this may mostly be noted. Its amount varies greatly; thus, the forefinger may often be passed from the bladder along the urethra up to the point of constriction. A well-known case of Sir B. Brodie's is the most remarkable on record. Speaking of a patient, he says, 'The posterior part of the urethra was so much dilated, that whenever he made water a tumour as large as a small orange, and offering a distinct fluctuation, presented itself in the perineum.'[3] The prostatic part, as was stated in the section relating to the anatomy of the organs, is the most dilatable portion of the passage, and usually exhibits a greater degree of expansion than the others. With this condition, also, it is occasionally observed, that the verumontanum has altogether disappeared, probably from the action of long-continued pressure.

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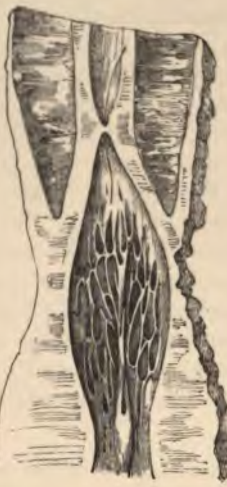
[1] *Trans.* vol. v. p. 210.

[2] Some fine examples of these effects of fluid pressure on the kidney &c. may be seen—Royal College of Surgeons, No. 1,868. King's College.—A preparation described in the Appendix, without a number, is extremely fine. St. George's.—R. 5—an extremely remarkable case. Middlesex.—A preparation without a number described in the Appendix. Effects unusually well displayed in the preparation: Edinburgh College of Surgeons, xxxi. F. Nos. 1,992, 1,975, and 1,978. A good example of sacculation of the kidney, resulting from stricture, with the penis itself, accompanied this essay, and is now deposited at the College of Surgeons. It belonged to one of the cases detailed in former editions.

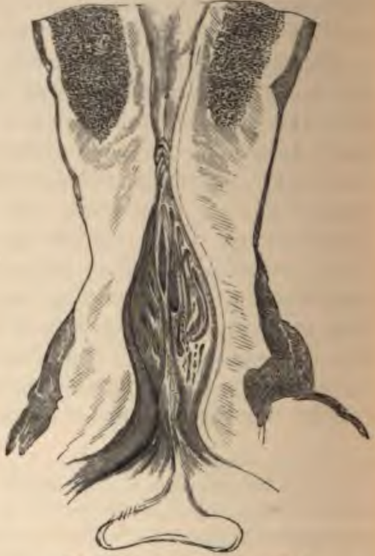
[3] *Op. cit.* p. 8.

FIG. 5.



This preparation accompanied the original essay, which formed the first edition of this work, to the College of Surgeons.

FIG. 6.

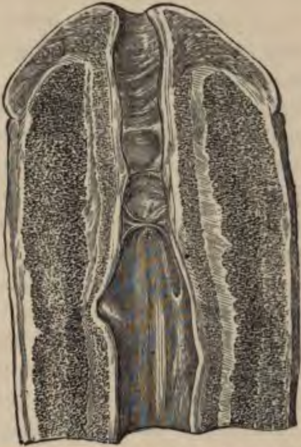


This preparation is described in the 'Pathological Transactions,' vol. vi. p. 245.

This process of expansion affects also all the natural openings into the urethra. Such are the lacunæ, and some of the larger glandular crypts, the prostatic and ejaculatory ducts: all these are frequently found enlarged to many times their natural size; the first-named are more especially evident at and about the situation of the stricture itself. Pouches are thus formed capable of entangling the point of a sound or bougie; and it is worthy of note that they are generally situated on the floor of the urethra; sometimes calculous deposits are found in them. The sinuses, which lie on either side of the verumontanum, are also, in many instances, considerably deepened, giving that body an appearance of unusual enlargement or development, while the septa intervening between the dilated mouths of the prostatic ducts often present the appearance of narrow fibrous bands crossing each other in all directions, forming a labyrinth or network exceedingly adapted to entangle an instrument, especially after it has been passed through a tight stricture, when the power of manipulating the point with delicacy is diminished by the grasp which the contraction exerts upon it. This condition, when existing as it frequently does posterior to the stricture, is well illustrated by the accompanying drawings taken from two specimens in my own possession. One (fig. 5) exhibits, moreover, a good example of annular stricture; the other (fig. 6) imperfectly represents a long and tortuous contraction. Distension of the seminal ducts, and even of the seminal vesicles themselves, is occasionally met with, and disease may be set up in these parts from the irritation thus caused.[1]

Anterior to the stricture, the urethra has been observed to be rather narrower than is natural, but it is not always the case. Such narrowing might be supposed to result from absence of the ordinary pressure of a normally sized stream of urine. When more than one stricture exists, there are sometimes inconsiderable dilatations between each.

FIG. 7.



Stricture affecting the anterior part of the Urethra.

**Ulceration of Urethra.**—Besides the expansion or dilatation produced by fluid pressure, another result is ulceration, commencing in the mucous membrane. This is closely adherent to the subjacent structures behind the stricture, and is irritated by frequent acts of micturition, with almost constant contact with urine, and it becomes the subject of chronic but severe inflammation. Thus, after death, the mucous membrane of the strictured part itself is opaque, white, and thickened, whilst that which is immediately behind is extremely thin, and its vessels are large, red, and injected. Ulceration commences at first very slowly, and may extend either deeply or superficially. Examples of both kinds are to be met with; some in the form of large ragged excavations are ascribed to this cause in numerous preparations.[2] The ulcerative process may even occasion the destruction of the stricture itself. Of this also, illustrations may be found in the College Museum;[3] Sir B. Brodie stated that he had met with one in his own experience.

**Abscess and Fistula.**—The irritation caused by urine which has escaped at an ulcerated part, perhaps in very minute quantity, into the submucous tissues, gives rise to a small collection of matter, which becomes circumscribed by lymph-deposit, by very slow degrees enlarges, absorbs adjacent structures, and at length appears in the perineum. Left to itself, the integuments gradually redden and give way, and the matter is evacuated. A quantity of urine, more or less considerable, issues by the aperture, when the act of micturition is performed, and thus is established a urinary fistula, which gradually becomes more patent, and may at length become the main channel for the passage of urine. Such was generally supposed to be the history of a *fistula in perineo*, but it is by no means necessarily so. An abscess may form in the neighbourhood of the urethra, without any previous lesion of the urethral walls, just as abscess occurs in the neighbourhood of the rectum without any direct connection with the gut, and on being opened by the surgeon, has evidently no communication with the canal at first. Two or three days afterwards, a few drops of urine make their appearance through the opening, and by-and-by a larger quantity passes, if the stricture is not dilated. Had continuity of passage originally existed between the urethra and the abscess, urine would have appeared at the first act of micturition after the pus was evacuated. If permitted to take its course, an abscess sometimes breaks into the canal, admits urine into its cavity, and subsequently enlarges considerably. If this be opened, or if it comes to the surface, as it may do in the course of time, fistula will follow of course. The route which these abnormal channels take is often very circuitous.[1] They may arise from any part of the urethra, and may open externally in any part of the scrotum or perineum, or even in the rectum, forming recto-urethral fistulæ. They are found sometimes passing through the glutæi muscles, and issuing at the nates, or among those of the thigh, or perforating the abdominal walls. A preparation, in which a urinary fistula traverses the thyroid foramen, exists in King's College Museum, No. 895. A case is preserved in the Museum of Guy's Hospital of a fistulous passage, in which almost all the urine issued by an opening at the umbilicus. In this case the remains of the urachus had evidently been opened up and dilated by the pressure of the urine. From all the points named, the greater portion, or indeed the whole of the urine, has been known to pass.

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[1] Guy's Hospital Museum, Nos. 2,398, 2,407$^{40}$.

[2] See notes of preparations, Royal College of Surgeons, 2,556, 2,557.

[3] Royal College of Surgeons, Nos. 2,542, 2,543. Bartholomew's, Series xxx. No. 32.

These fistulæ soon become lined with a pseudo-mucous membrane, which it is not necessary to describe here, and deposits of lymph take place slowly but extensively into the cellular tissue around them; their orifices are usually surrounded by some prominent granulations, and the neighbouring skin is reddened and thickened also from the continued contact of urine. When the condition described has remained unrelieved for a long period, interstitial infiltration of the surrounding parts often produces considerable deformity; the prepuce becomes distended with solid deposit; the scrotum forms a large irregular misshapen mass of indurated matter, in which the penis itself may be almost buried. Abscesses are formed in all the parts adjacent; in the erectile bodies; above and around the membranous portion; about the prostate, very frequently in the substance of this organ, which indeed is sometimes infiltrated throughout with pus, the whole of the proper tissue being disorganised; in the cellular tissue which surrounds the base of the bladder, or in the walls of the viscus itself, as well as in more distant parts, by the track of the fistulæ already described. Occasionally, from the constant passage of unhealthy urine through these intricate abnormal passages, the deposition of phosphatic matter is favoured at points of their course, forming mortar-like masses, embedded in the substance of the tissues around the canal. So in cavities of the prostate the same formation is prone to take place.

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[1] See notes of preparation, Royal College of Surgeons, No. 2,555 particularly; six or eight other examples are quoted close by.

**Extravasation of Urine.**—When, as not very unfrequently occurs, any accident leads to the sudden and large extravasation of urine through rupture of the urethra during retention, all the appearances of active inflammation are rapidly presented, and these are followed by extensive sloughing of the skin, cellular tissue, and the structures of the penis and scrotum and adjacent parts. The appearances which are commonly exhibited in such instances need not be given in detail here; suffice it to say that very extensive disorganisation of the connective tissue takes place from the forcible entry of the extravasated urine amongst the tissues, showing itself by enormous distension and discolouration of the scrotum and penis, and even of the lower parts of the abdomen. (See chap. xi.) The variations which may be presented by different cases will appear not so much in the nature as in the extent of these lesions. It may be remarked that the original rupture of the urethra which has permitted extravasation to take place, does not occur by mere mechanical distension, but in a very gradual manner through ulceration and sloughing of its tissues in consequence of that unhealthy inflammation to which the presence of irritating matters has given rise.

**Growths in the Urethra.**—In the writings of the old anatomists and surgeons, we find the symptoms of stricture attributed to a pathological condition very different from that which modern researches have taught us to recognise. Ancient writers attributed the narrowed stream and painful straining of stricture to the presence of some growth into the urethra; and accordingly they named these supposititious bodies, '*fungi*,' '*carnosities* or *caruncles*,' and '*excrescences*,' and presented them as the common cause of urinary obstructions.[1]

In a very small proportion of cases these bodies certainly do exist, and I have considered it legitimate to include them as a very small class under organic stricture, a position which their nature and origin entitle them to bear. Their rarity, however, must be inferred, not only from their very infrequent occurrence among the preparations in our Museums, but also in the records which later anatomists have left respecting them. Among these I shall briefly refer to some whose observations may be implicitly relied upon.

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[1] They were so regarded up to about the close of the seventeenth century: Brunner, Physician to the Elector Palatine, 1690, and subsequently Dionis, believed stricture to be generally due to cicatrix following an ulcer, an opinion which was very generally received until late years.—*Cour d'Oper.* Dionis, 2nd ed. Paris, 1716, $3^{\text{ième}}$ Demonst.

Hunter states that he met with only two cases; one of them forms Prep. No. 2,577 in the Royal College of Surgeons' Museum, there called 'caruncle.'

Sir Charles Bell saw them rarely, but figured in Plate IV. fig. 1 F, of the 'Engravings from specimens of morbid parts,' &c., 'certain little white bodies like caruncles.' In this plate they are five in number, and vary in size from that of a grain of rice to that of a small pea. They are situated in the bulbous part of the spongy portion. In Plate V. fig. 5, are 'little warty excrescences,' stated by the author to be 'very imperfectly represented by the engraver.' In this preparation there are two or three strictures, and these bodies are behind that which is last or farthest from the external meatus.

Arnaud, in his work published in London in 1769, Observation 10, describes at length a case in which there existed 'a polypous excrescence which came out of the urethra near half an inch long . . . the vegetation was red, fibrous, softish, and almost filled up the orifice of the urethra.' Two other cases are recorded in the same work.

Morgagni, in his forty-second letter, speaks of having met with only one in many examinations.

Pascal, in his 'Treatise on Gonorrhœa,' article 3, gives the history of two soldiers, patients in the hospital of Milan, in 1718, whose urethras were found after death filled with fungous and callous excrescences, a condition which he states to have been the cause of their death.

Among more recent authors, Desault never met with a single example during the whole of his experience.[1] On the other hand, Amussat, Civiale, Lallemand and others have seen a case or two: the first-named exhibited a specimen to the Academy of Medicine of Paris. Velpeau met with two cases only. In both of these he describes them as vascular excrescences situated just behind the meatus urinarius. Ricord has also met with them: his description is similar. Mercier has seen one remarkable example, in which 12 or 13 little excrescences, each about the size of a barleycorn, and having a narrow pedicle, were found between the prostatic portion of the urethra and the external meatus.[2] Chelius states that he has met with only one case; in this the fossa navicularis was the part affected. Leroy D'Etiolles records three instances, in one of which he observed an excrescence the size of a pea, after death; the other two were cases in which he removed them during life. He also figures one in his work, and remarks, respecting these growths in general, that when situated near to the neck of the bladder they assume the form of little polypes, and that in the remainder of the canal they have a similar appearance to the vegetations which are common upon the surface of the glans penis. This remark receives some support from the appearances presented by the few specimens of urethra papilloma preserved in the Museums of the metropolis. One only exists in the Royal College of Surgeons, viz. Preparation No. 2,000. In this they are confined to the neck of the bladder and the prostatic portion of the urethra, the remainder of which is entirely free. One of the best examples is in the Museum of Guy's Hospital, where it forms Prep. No. 2,411. It is a single growth, about nine lines long by three or four broad, springing from the junction of the membranous and prostatic portions. It gave rise to the symptoms of stricture during life, and appropriate treatment was employed. Fig. 8 represents it of the natural size.[1]

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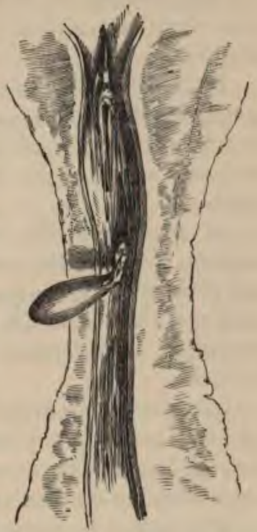
[1] *Œuvres Chir.* tome iii. p. 270. Paris, 1803.

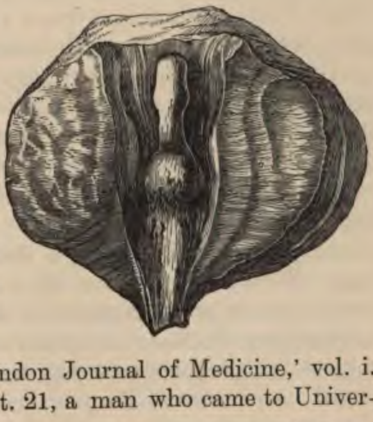
[2] *Recherches Anat., Path. e Thérap. sur les Maladies des Organes Urinaires et Génitaux.* Par L. Auguste Mercier. Paris, 1841, p. 121.

FIG. 8.



I met with a good example of polypoid tumour springing from the verumontanum, in the prostate of a man, aged 54 years, a patient in the St. Marylebone Infirmary. The only sign of its existence, which could be ascertained during life, was an increased frequency of micturition. It is described in the Transactions of the Pathological Society of London, vol. vii. p. 250, and is represented of the natural size at fig. 8.

FIG. 9.



Rokitansky states 'that polypous or condylomatous growths of the urethral mucous membrane are a consequence of gonorrhœa, but that he has observed them very rarely.'

Mr. H. B. Norman, in the 'London Journal of Medicine,' vol. i. 1852, records the case of M——, æt. 21, a man who came to University College Hospital for stricture. The symptoms were due to a bright red and very vascular growth situated within the urethral orifice; it was nodulated, raspberry-like, and bled on being touched; it was not pediculated, or but very slightly so, and the growth, which was about the size of a small cherry-stone, lay entirely within the urethra.

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[1] See also No. 2,578. In Bartholomew's Hospital Museum, Series xxix. No. 9, and Series xxx. No. 13. Middlesex Hospital Museum, No. xl. 2. St. Thomas's Museum, B B, Nos. 8 and 9.

Mr. Guthrie has seen several such near the orifice of the urethra, measuring from about a quarter to half an inch in length, and resembling a bunch of granulations. He has not seen tubercles or caruncles affecting the urethra to any extent, at any other part, after death.

Of those near the external meatus, I have seen a few examples consisting of vascular growths springing from the mucous membrane, and generally following neglected gonorrhœa and balanitis. And not long ago I saw a small papilloma in the prostate portion of a urethra of an elderly subject who had long been suffering from severe cystitis.

Other instances might very probably have been adduced, but enough has been done to show how rarely do these growths occur to interfere with the course of the urine, few surgeons having in their own experience encountered more than two, or at the most three examples.

The nature of those which are found at the anterior part of the canal, and which are almost confined as regards situation to the fossa navicularis, appears to be that of ordinary papillæ, hypertrophied, and in a state of unusually active growth. They are usually soft, and of a rose-red colour, bleed very readily, and are not very sensitive. They are related to the vegetations which sometimes flourish luxuriantly upon the glans penis and neighbouring parts, perhaps more vascular, and are covered by a thinner cuticle, as being more protected by situation. That they are, but more rarely, to be found in the posterior parts of the canal is proved by some of the preparations referred to.

On the other hand, the strictly polypoid growths which I have seen are confined to the prostatic portion, or are accompanied by others at the neck of the bladder or within it, to which latter they are then secondary formations; for they are more frequently found affecting the bladder only. When small their structure consists of little more than hypertrophied mucous membrane. Rokitansky's observations on the origin of polypoid formation in the mucous membranes may be quoted here. Having described the effects of chronic inflammation on a mucous membrane, he adds, 'Sometimes, from the great increase in the size of its papillæ and follicles, it is warty and rugged; and lastly, even duplicatures and prolongations may be found upon it. The two last-mentioned inequalities of the membrane are permanent, immovable folds of the membrane; they constitute what is called the mucous or cellular polypus, or the vesicular polypus. These polypi are processes of the mucous membrane of various thickness and length.'[1] In enumerating the localities liable to be their seat, the author places the urethra almost last as regards frequency.

The conclusions to be drawn from the facts known respecting growths into the urethral canal are:

First, that while a granular condition of the mucous membrane is not unfrequently found in the neighbourhood of old stricture, particularly behind it, the existence of any excrescence so large as to attract observation as an independent growth obstructing the urethra is extremely rare.

Secondly, that these bodies consist of ordinary granulations arising from diseased mucous membrane behind a stricture; or of the vascular hypertrophied papillæ already described, usually close to the external meatus; or of polypoid growths confined to the posterior part of the urethra, which are of the nature of papilloma, resembling that more frequently found affecting the bladder. These last are extremely rare.

Thirdly, with reference to the occasional appearance of cancerous growths in the urethra, where they can scarcely be said to produce any form of disease beyond that of ulceration, certainly not tumour, their occurrence is always secondary to the prior affection of other organs, and generally not until the disease has largely affected other portions of the urinary apparatus.[2]

**Locality of Stricture.**—There is some discrepancy in the statements of authors as to the part of the urethra at which stricture is most frequently situated. I shall, therefore, as heretofore, record first the labours of others, whose accuracy and opportunities for observation have been undoubted, and then state what I believe to be the true conclusions which these, coupled with my own researches, have enabled me to arrive at.

The first thing to be borne in mind in comparing the experience of different authors on this subject is, that some give measurements of the distance in inches at which the stricture is found from the meatus externus, made after death, while the measurements of others are taken during life by passing an instrument down to the point of obstruction. How much difference must appear in the results of the two modes, may be inferred from statements already made as to the normal length of the urethra. We have seen that the canal is naturally one inch less in the latter than in the former condition, and that by stretching it, inadvertently or otherwise, that difference might be readily doubled. Others have specified the locality of stricture, without reference to any measurement, but by naming the anatomical region in which the narrowing is situated. This, if accurately done in the dead-house, is perhaps the best method, but the alleged topography of a stricture after observation during life is generally singularly incorrect, unless the plan of measuring from the external meatus is adopted, always of course during the ordinary flaccid condition of the organ.

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[1] *Op. cit.* vol. iii. p. 52.

[2] Illustrations of these remarks will be found in the Royal College Museum, Prep. No. 2,010; St. Thomas's, B B, Nos. 17 and 19.

The following extracts are made as brief as possible, consistently with the transference of the authors' opinions to these pages:

From John Hunter.—'Every part of the urethra is not equally subject to stricture, for there appears to be one part which is much more liable to them than the whole of the urethra besides, i.e. about the bulbous part. We find them, however, sometimes on this side the bulb, but very seldom beyond it. I never saw a stricture in that part of the urethra which passes through the prostate gland.'[1]

Sir E. Home.—'Strictures occur most commonly just behind the bulb of the urethra; the distance from the external orifice being six and a half or seven inches; the situation next in order of frequency, is about four inches and a half from the orifice of the glans; they do occur at three inches and a half, and sometimes almost close to the external orifice.'[2]

Sir B. Brodie.—'In the majority of instances, the disease began in the anterior portion of the membranous part of the urethra, behind the bulb, and in the situation of the triangular ligament of the perineum; that in some instances it had its origin in the urethra, somewhere between the part just mentioned and the external orifice, and that in a few cases it is confined to the external orifice, and the canal immediately adjoining to it.'[3]

Mr. Liston.—'The passage is contracted at various parts; most frequently at about four inches from the meatus, but sometimes much nearer, and even close to it. The urethra is often enough narrowed as it passes through the deep fascia, betwixt its sinus and the apex of the prostate.'[4]

Mr. Shaw.—'I have not, in more than a hundred dissections which I have made of diseases of the urethra, seen a stricture or narrowing of the canal posterior to the ligament of the bulb; nor have I been able to find one example of stricture beyond this part among those preserved in the College Museum.'[5]

Sir Charles Bell expresses exactly the same opinion.[6]

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[1] *Op. cit.* p. 165.

[2] *Op. cit.* vol. i. pp. 26–7.

[3] *Op. cit.* p. 4.

[4] *Practical Surgery*, 4th ed. p. 468.

[5] A paper on 'Stricture,' by John Shaw, *Med.-Chir. Trans.* vol. xii. 1823.

[6] *Treatise on Diseases of the Urethra.* By Sir Charles Bell. 3rd ed. p. 184. London, 1822.

Mr. Benjamin Phillips.—'In a hundred and seventy-three cases which I have selected, the disease was seated at the following distances from the orifice of the urethra :

In 9 the distance did not exceed 1 inch.
In 8 from . . . . . 1 to 2 inches.
In 13 from . . . . . 2 to 3 "
In 11 from . . . . . 3 to 4 "
In 98 from . . . . . 4 to 5½ "
In 40 from . . . . . 5½ to 6½ "
In 10 from . . . . . 6½ to 7½ "

. . . The disease, when at a greater distance from the orifice than four and a half inches, was seated either in the neighbourhood of the curvature of the urethra, or between that point and the prostatic portion of the canal, and that the difference in admeasurement was dependent on the length of the organ.'[1]

Civiale.—'The only regions of the urethra where one finds true organic strictures are these :

'1. The external orifice.

'2. The two extremities of the fossa navicularis.

'3. The anterior region of the spongy part.

'4. The sub-pubic curvature at the junction of the bulbous and membranous portions.

'In other terms, the strictures occupied sometimes the extremity of the urethra, sometimes the region, the depth of which varies from one to three and a half inches, and sometimes a part five inches deep.'[2]

Amussat 'finds that the most common seat of the disease is in front of the junction between the bulb and membranous portion.'[3]

Vidal.—'At the junction of the membranous and bulbous portions, rather towards the first, it is that true contractions most frequently occur.'[4]

Ducamp says 'that in five cases out of six, strictures are found at between four and a half and five and a half inches from the meatus, ranging between four inches nine lines, and five inches three lines.'[5]

Leroy d'Etiolles.—'Nineteen-twentieths of strictures exist at a depth which varies from five to six inches, that is to say, immediately behind the bulb, at the commencement of the membranous portion. . . .

'In the second order of frequency are the strictures of the posterior lip of the navicular fossa.

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[1] *A Treatise on the Urethra*, by Benjamin Phillips. London, 1832, pp. 149–50

[2] *Traité Pratique sur les Maladies*, &c. Paris, 1837, pp. 124–5.

[3] *Leçons sur les Rétentions d'Urine*, &c. Paris, 1832.

[4] *Pathologie Externe*, tome v. p. 52, 2nd ed. Paris, 1846.

[5] *Traité des Rétentions d'Urine*, &c. Paris, 1822.

'In the third order are those of the urinary meatus.

'In the fourth order come strictures of the spongy portion, situated at two inches to two and a half from the urinary meatus. . . . I have also myself observed stricture in the prostatic region, and one may see a specimen in my collection.'[1]

Ricord also affirms that he has met with prostatic stricture.

In reviewing these observations there is not much difficulty in reconciling somewhat discrepant statements, if we recall the sources of fallacy already named. With one exception, all the authorities agree in one particular, viz. that stricture is most commonly found at the sub-pubic curvature. But it is obvious that the statements cited are generally not based on precise anatomical examination. Mr. Shaw's observation must be accepted. His record, the result of numerous dissections, is strikingly precise, and in accordance with all modern experience. No doubt can exist as to the fact, which John Hunter observed, that stricture very rarely affects any other portion of the urethra than that which is anterior to the deep perineal fascia. It has long been observed that the two spots which suffer most from gonorrhœal inflammation are the fossa navicularis and the bulb; I have had opportunities of observing this two or three times in the dead-house, on the bodies of patients who had been suffering from gonorrhœa shortly before death. Rokitansky also says:

'The inflammation of urethritis is either uniformly diffused over the urethra, or is limited to one or more spots. The latter is especially the case in genuine gonorrhœa of the male urethra: we here find not only the navicular fossa, but every point as far as the prostatic portion, *and especially the vicinity of the bulb*, liable to become the seat of the disease.'[2]

M. Guérin, before quoted, ingeniously suggests that the reason why the bulbous part is so subject to stricture is to be found in the fact that the corpus spongiosum is larger and more vascular there than elsewhere. The amount of inflammatory effusion may be assumed to correspond with the amount of blood supplied; hence the deposit of lymph will be more abundant in the vascular bulb than in front of it.[3]

From Mr. Phillips's researches, which were made with a direct view to the solution of the question of locality, it must be inferred that the contraction, when not situated absolutely at the anterior layer of the deep perineal fascia, is more commonly found before than behind it, and existing consequently in the bulbous portion itself. The statement which differs most widely from this is that of Mr. Liston, which declares a part of the urethra about four inches from the external meatus to be the most favourite situation for stricture. His words are, however, evidently intended, from the connection in which they appear, to apply to the living, and not to the dead subject; the difference, therefore, is rather apparent than real; the locality which he indicates being that which my own investigations prove to be, not absolutely first, but very nearly so, in degree of liability to the affection in question.

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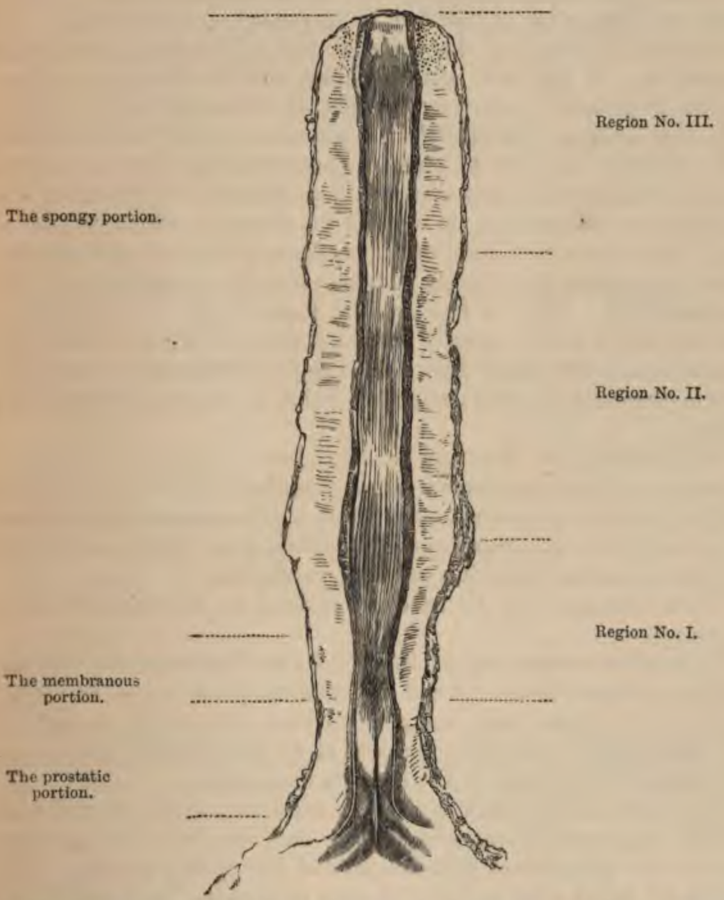
[1] *Des Rétrécissements de l'Urèthre*, &c. Paris, 1845, pp. 82–3.

[2] *Pathological Anatomy*. Sydenham Society (translated by Dr. Day). Vol. ii. p. 233.

[3] *Mémoires de la Société de Chirurgie*, May 1854. Paris, p. 131.

Fig. 10.



A healthy urethra, eight inches and a half in length, slit up from the upper part, accurately reduced on scale from a drawing made from the original while fresh, to half the natural size. On the left-hand side are indicated the anatomical divisions of the urethra, and on the right the boundaries of the regions referred to in relation to the locality of stricture.

The examination which I have made included a very large number

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of cases; as may be seen by the facts given in the Appendix, and by the references there made to preparations in almost every public Museum in the metropolis; to those in the Museum of the Royal College of Surgeons, Edinburgh, which comprises Sir Charles Bell's collection, as well as to the very few contained in the Musée Dupuytren of Paris.

These observations coincide with the opinions just quoted, which assign the first place, in relation to frequency of occurrence, to the stricture which occurs at the posterior part of the spongy portion of the urethra. It has been already shown, that in reporting on anatomical preparations, the only method of conveying a correct idea respecting locality, is to identify the contraction with certain regions of the urethra, and not to trust to measurements from the orifice simply. This principle has therefore been adopted as the basis of the classification of strictures, in respect of situation, which is offered here. After much consideration I have deemed it best to make as few classes as possible, consistently with an accurate representation of the facts exhibited. And the formation of these classes, be it remarked, does not result from a merely arbitrary division of the urethra, but certain natural indications have been followed, inasmuch as some portions of the canal are unquestionably liable to be more affected than others.

In examining the Museums named, I have submitted to a careful inspection not less than three hundred preparations of stricture of the urethra, of which I possess notes made on the spot of two hundred and seventy, the rest being examples which, from decay or other circumstances, it was impossible correctly to classify.

These examples may all be comprehended by the three following classes:

**I. Strictures occurring at the Sub-Pubic Curvatnre**, i.e. at the junction between the spongy and membranous portions and its neighbourhood; the latter term being understood to comprise an inch of the canal before, and three-quarters of an inch behind, that point, thus including the whole of the membranous portion.

That part of the urethra which is most frequently affected with stricture is the portion comprised in the inch anterior to the junction, that is, the posterior or bulbous part of the spongy portion. The liability of this part to stricture appears to diminish as it approaches the junction, where it is less common; while behind this point it probably never exists, except from a traumatic cause.[1]

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[1] Such an one exists in the Museum of St. Thomas's Hospital. The preparation is numbered D D, 3.

It is important to remember that the word 'membranous' is very inaccurately employed in Museum catalogues, and especially in that of the College of Surgeons, in describing the situation of stricture. Mr. Shaw, in 1823, did not recognise one example there. Sir Charles Bell held the same opinion. The only examples

**II. Strictures occupying the Centre of the Spongy Portion,** i.e. a region extending from the anterior limit of the preceding, to within two inches and a half of the external meatus, and measuring therefore about two and a half to three inches in length.

**III. Strictures occurring at the External Orifice, and within a distance of two inches and a half of it.**

The following is an analysis of the 270 preparations referred to; they exhibit 310 distinct strictures:[1]

| | | |
|---|---|---|
| Total number of strictures, | 320 | |
| ,, In Region I. . . | 215 | or 67 per cent. of the entire number |
| ,, ,, II. . . | 51 | or 16 ,, ,, ,, |
| ,, ,, III. . . | 54 | or 17 ,, ,, ,, |
| | 320 | |

Of these:

There were 185 examples of *one stricture only*, situated in Region I.
,, ,, 17 ,, ,, ,, ,, Region II,
,, ,, 24 ,, ,, ,, ,, Region III.
There were 8 *cases* in which the urethra was strictured in all three Regions.
,, ,, 10 ,, ,, ,, ,, ,, in Region I. and II. only.
,, ,, 10 ,, ,, ,, ,, ,, in Region I. and III. only.
,, ,, 13 ,, ,, ,, ,, ,, in Region II. and III. only.

**Lastly.**—I may confidently assert that there is not a single case of stricture in the prostatic portion of the urethra, to be found in any one of the public Museums of London, Edinburgh, or Paris. I am disposed to believe that some observers have been deceived in reference

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which, after a very close examination, appear to be strictures of the membranous portion, are Nos. 2,553 and 2,560. To this day the erroneous designations in regard of situation of stricture are still attached to the preparations in the Museum.

[1] The numerous preparations of strictured urethra in the Museum of the Royal College of Surgeons in Dublin were carefully examined by Mr. Walsh of that city. That gentleman's report appeared in a note to a course of lectures by him in the *Dublin Medical Press* in 1856; and it very nearly corresponds with my experience as given in the text. Mr. Walsh says, 'I find the seat of stricture to be as follows: $\frac{2}{3}$ are situated at the anterior part of the bulb; $\frac{1}{6}$ at the orifice of the urethra; $\frac{1}{6}$ about two inches from the orifice; $\frac{1}{6}$ at four inches from the orifice; and $\frac{1}{12}$ at the membranous portion. There is one preparation which I think should be mentioned on account of its rarity, and because the situation of the stricture is generally denied, viz. a stricture commencing in the posterior part of the membranous portion, and extending into the prostatic portion, causing a well-marked stricture there.

'By arranging the collection in our Museum according to Mr. Thompson's division of the urethra, we have the most frequent situation of stricture in the first division; the next in the third division; and the least frequent in the second. This agrees with Mr. Thompson's experience.'—*Dublin Medical Press*, Jan. 23, 1856, p. 51.

to it, or that it owes its supposed existence to inferences drawn from the results of examinations of the living body, which can by no means be admitted as evidence on this subject. Two specimens only of the whole number have at any time been regarded as liable to be considered prostatic stricture; viz. No. 3 D D, St. Thomas's Hospital Museum, and No. 2110 xxxii. E, of the Museum of the Royal College of Surgeons, Edinburgh. Besides these are the two cases which rest on the observations of Leroy D'Etiolles and Ricord.[1] Its excessive rarity, to say the least, is at all events demonstrated, and in any case it is probably traumatic in its origin.

It is almost unnecessary to add, that enlargement of the prostate, while it sometimes narrows, and frequently renders tortuous, that part of the urethra which passes through that organ, cannot be regarded as coming within the definition of stricture. That organic narrowing of the urethra only, which commences within its own walls, and not that which is caused by external tumour, being understood to constitute the stricture which, commonly affecting all other parts of the urethral canal, is not found in its prostatic portion.

It may perhaps be considered that an amount of labour has been bestowed upon the acquisition of facts respecting the situation of organic stricture, which is more than commensurate with the importance of the subject. I do not, however, regret the pains bestowed upon the elucidation of a point which bears an important relation to the question of cutting operations for the treatment of stricture hereafter to be discussed, and which I may be permitted to say could not be accomplished without a more comprehensive examination of existing data than has been previously made.

## CHAPTER III.

### SYMPTOMS AND PATHOLOGICAL EFFECTS OF ORGANIC STRICTURE.

THE symptoms of stricture of the urethra will be considered as they appear in order, at the origin, and during the progress of a case, with the complications commonly observed, so as to present an epitome of those records on this subject which clinical surgical case-books and like records amply supply.

**Early Symptoms.**—The chain of occurrences which unites the first lesion of the urethral canal with that degree of contraction which becomes obvious to the patient as a stricture, and for the first time brings him under the notice of the surgeon, is of necessity rarely to be observed. Neither is it possible always to learn what that original lesion was, or when it took place, or, although very rarely, whether any distinct cause was recognised at all. But in the vast majority of cases we shall find it traced by the patient himself to the occurrence of an attack of urethritis, between which and his discovery of stricture an interval of time, greatly varying in different cases, has existed. Thus in some instances, narrowing of the stream has been observed to take place within two or three months after the appearance of a gonorrhœa; while some patients protest that they have never experienced any change for many years after such an attack, and then, with no other assignable cause, contraction of the passage is first discovered. In the estimation of all such statements, allowance must be made for the great indifference and obtuseness to sensations which some individuals exhibit, as compared with the hypersensibility and studious attention to their own feelings met with in others. Thus agricultural labourers, as a body, are remarkably careless respecting the occurrence of any morbid condition, or the imperfect performance of their animal functions, provided no great measure of pain be present; and they will often suffer a very considerable amount of inconvenience without any anxious speculation as to the cause, or convictions respecting the necessity of obtaining professional assistance. The inhabitants of towns, on the contrary, are often more acutely sensitive to deviations from their healthy state, and more prone to entertain serious views of these as well as of other bodily ailments. Hence it is necessary to bear these facts in mind, and to test the statements which a patient makes, in order to obtain from him a true history, and this it rarely will be, however desirous the investigator is to acquire the simple facts, unless the patient's statements are patiently tested by cross-examination.

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[1] See note also on the preceding page, in which Mr. Walsh of Dublin describes a stricture extending from the membranous to the prostatic portion.

The earliest symptom usually noticed is a little gleety discharge, almost constantly present in greater or less quantity. Some uneasiness is felt, or a little smarting, in some part of the course of the urethra, when the urine passes over it in micturition, varying in intensity. The contents of the bladder are emptied at shorter intervals than natural. The stream is somewhat altered in form, not having the full rounded character of health, but more or less flattened; it may be twisted, forked, or divided, conditions which are caused by the current being insufficient in volume to extend the lips of the meatus externus, so that the fissure-like form of that opening modifies the stream; and if its momentum be insufficient to separate one lip from the other, the urine issues above and below, so that two small streams are produced instead of one. At the same time, it must not be concluded that the existence of such a stream is by any means, *per se*, a proof that stricture exists, since many persons, from a tumid condition of the meatus alone, habitually pass such an one. Then gradually, as contraction increases, or as fresh obstruction occurs in other parts of the urethra, the stream grows smaller, and in time the urine may issue only by drops. Meantime, although the contractile power of the bladder is augmented, there is little momentum in the current which leaves the meatus, and the urine cannot be projected to any distance. Often the efforts at the commencement of the act of micturition are repeated during several moments, or even for a minute or two, before the urine can be made to issue at all; and after the stream has stopped, and the muscular contractions of the bladder and abdominal muscles have ceased, a few drops trickle away subsequently, an occurrence which is due to imperfect closure of the canal, occasioned by the presence of indurated tissue about the stricture, so that the sides of the canal cannot be brought into close approximation. Hence the little dilatation which sometimes exists behind a stricture, contains some fluid not expelled by the ordinary efforts, and this dribbles out by the force of gravity when the penis assumes the pendant position. Generally speaking, the act of micturition is always prolonged to an extent corresponding with the degree of obstruction present.

**Advanced Symptoms.**—One of the most distressing symptoms, perhaps, from which the patient suffers, is the constant desire to make water, almost invariably present in severe cases, giving rise, as it does, to frequent and painful acts of micturition. In this way the sleep is much broken, some patients being compelled to rise from bed ten or twelve times in the course of the night, while, in the worst cases, or during temporary exacerbations of the complaint, much time is spent in laborious efforts, by change of posture or by straining, to obtain relief. These frequent calls to micturate may arise in part from diminished capacity in the bladder, but chiefly from increased irritability, which may lead to, or be the result of, existing chronic inflammation of the organ, or from an abnormal condition of the urine itself, presently to be noticed; or, indeed, as is most commonly the case, from all three combined. Co-existent with these conditions there is a sense of heat, soreness, or smarting in the bladder and urethra, aggravated by excess of acid in the urine, by external cold, or imprudence on the part of the patient. Pain is often felt above and behind the pubes, a symptom generally significant of the presence of chronic inflammation affecting the mucous membrane of the bladder. Sometimes a dull aching pain in the glans penis, in the perineum, or in the back and loins, is most complained of, sometimes severe pain in one or both testicles, extending to the spermatic cord, or into the groins. The general irritation of the urinary organs, extending more or less to the seminal vesicles, occasions emissions and sexual weakness. Pain is often experienced in coition; and if the contraction be considerable, the semen passes backwards, in part or entirely, into the bladder, from which it is discharged afterwards, so that the power of fecundating may be lost from the mechanical obstacle to the act of ejaculation; or the erection may be rendered imperfect by effused lymph into the cells of the corpus spongiosum preventing the free circulation of blood through it. And in some cases a purulent discharge resembling gonorrhœa, but milder in character, is liable to follow sexual intercourse.

The repeated expulsive efforts of the bladder excite uncontrollable straining action of the rectum, and this induces changes in the anus, viz. more or less protrusion of the mucous membrane through the external sphincter, heat, irritation, and inflammatory thickening; so that hæmorrhoids and prolapsus of the mucous membrane are by no means unfrequent consequences of a long-continued or tight stricture of the urethra. Some patients rarely attempt to pass water without visiting the water-closet, from their inability to prevent the escape of the contents of the rectum through the efforts required for micturition. Even herniæ of the intestine have sometimes occurred from the muscular exertions so made.

In most cases, also, some muco-purulent secretion from the canal is seen with an opaque and slightly yellowish appearance. Not unfrequently it is transparent, or nearly so, and contains numerous fibrous shreds floating in it, like particles of vermicelli. Indeed, the existence of a long-standing or obstinate '*gleet*,' as such chronic discharge is termed, should always arouse inquiry for stricture, and a bougie should be passed in order to ascertain the calibre of the canal. Instances are common in which this symptom has been so prominent that the patient has been treated for gonorrhœa during a considerable period without any suspicion that a stricture was its sole cause; the subsequent recognition of the contraction and its cure, having been attended with cessation of the discharge.

**Retention of Urine.**—Occasionally the first indication of the presence of stricture is the occurrence of complete retention of urine. The contraction had previously been insufficient to call the patient's attention to it; but after exposure to cold, or some unusual irregularity, or by too free indulgence, either in the use of alcoholic drinks, or in sexual intercourse, or in both together, when an attempt is made to empty the bladder, which may have rapidly filled from the effect of stimulus on the kidneys, the individual is alarmed to find himself unable to evacuate more than a few drops. Such a condition occurs sometimes, although rarely; and it is necessary to allude to it here; but it will be considered under another head, inasmuch as the phenomena described may occur without the necessity of assuming the prior existence of organic contraction of the canal.

There are a few cases, also, in which the most prominent symptom throughout is liability to partial but frequent attacks of retention of urine. There may be but little irritability of bladder, and the stream of urine, when passed, is not necessarily very small; a No. 6 or 7 catheter may pass through the urethra; but marked organic stricture is present, and may perhaps be verified by the touch, as a ring of indurated material in the course of the urethra. The patient is liable to retention on very slight provocation, and finds no relief but from catheterism; attempts at dilatation are always followed by inability, more or less prolonged, to pass water, at least until a calibre of large size has been attained by treatment.

Closely related to this condition is another observed in some cases, chiefly those of long standing, the prominent symptom of which is a tendency to rapid recontraction of the stricture after dilatation. It may be amenable to this treatment, so that instruments of medium or even of full size can be introduced, but after a few days of cessation from treatment, the narrowing is as complete as ever, and a small instrument only can be passed. The symptoms find only a temporary palliative in dilatation, and soon again become severe. These phenomena seem to arise from elasticity in the materials of the constricting tissue itself, which appears to possess almost the mechanical properties of india-rubber. This condition in its most confirmed form has been called 'the resilient stricture;' and it affects strictures in all situations, but especially those near to the external meatus, and in the anterior half at least of the spongy portion.

**Changes in the Urine.**—The urine exhibits changes which become more marked in proportion as the case advances without relief being afforded. Owing to the retention of a portion of urine in the bladder, from deficient power in the organ to empty itself, partial decomposition of the secretion follows,[1] occasioning irritation of the mucous membrane; and thus the urine becomes cloudy, emitting a pungent ammoniacal odour, and depositing, as it cools, a quantity of pus and mucus, the products of inflammation of the bladder. This is the origin of the slimy tenacious deposit found adhering to the bottom and sides of the vessel containing it, which is so characteristic and well known. Such urine is usually alkaline to test paper, in which case it generally deposits also a dense pale precipitate, which the microscope shows to be composed chiefly of the prismatic crystals of the triple phosphate of ammonia and magnesia, of epithelium in various forms and sizes, and pus corpuscles. An iridescent pellicle commonly found to consist of the triple phosphate and sometimes of the phosphate of lime, is often seen on the surface of the secretion after standing. Urine, however, is not invariably alkaline when mucus is present, although the latter secretion being naturally so; may, if in sufficient quantity, communicate to slightly acid urine a degree of alkalinity. It is not uncommon to observe in chronic cases that the mucus discharge is streaked with opaque white striæ of phosphate of lime also. In these circumstances the conditions favourable to the formation of calculus being present, we sometimes find a phosphatic formation in the bladder, co-existing with long-standing obstruction in the urethra. In other cases, where the chemical changes described do not occur to any great extent, the urine may be extremely fœtid, although not ammoniacal or alkaline, from the evolution of sulphuretted hydrogen, by decomposition of organic matters thrown off from the urinary passages and mingled with the urine. Lastly, hæmaturia is one of the occasional concomitants of stricture. The blood may come from the bladder in small quantity, as a result of chronic inflammation, communicating a dark tint to the urine. It frequently follows the use of the catheter, when the colour is florid; but the same appearance may occur when no instrumental interference has taken place. It may then be due to the rupture of some vessels during erection of the penis, the urethra being unduly confined by the presence of the stricture, and strained by the act. Thus painful erections resembling chordee are apt to occur, and the blood passed may be only partially mixed with the urine in the bladder; or it may appear by itself, and not during the act of micturition; or it may only form a clot in the urethra, and be expelled as such during that process.

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[1] The process by which carbonate of ammonia appears in the urine and renders it not only alkaline but extremely irritating, is thus explained. The urinary principle Urea $(NH_2)_2CO$, a somewhat complex organic salt, contains the elements of carbonate of ammonia, minus water (HO). It is prone to decompose, acquire this water, and so produce the latter salt. This occurring in contact with sensitive tissues within the bladder, soon irritates and inflames them. It is not that the urine is secreted alkaline; on the contrary, acid; but on arriving in the bladder it mixes with other urine, in which the change has already commenced, and containing much of the mucous secretion from the bladder itself, the presence of which appears to favour the rapid occurrence of the decomposition in question.

**Retention and Engorgement.**—As the case advances, attacks of complete retention, depending on causes above mentioned, become more frequent; each attack, from a variety of causes, leaving the stricture mostly somewhat worse than before. The urine is at length habitually discharged by drops, so that a stream cannot be said to exist. Sometimes the urine passes away involuntarily during the unconsciousness of sleep; and at length the patient loses power to retain it. At this stage 'incontinence' is often said to occur, a term which is incorrect and therefore liable to mislead, since the bladder is already overcharged, and a small portion only escapes. Thus among the poorest class, such a patient suffers from excoriation, and great discomfort; and is rendered offensive to those with whom he comes into contact. The bladder should be described by the term 'engorged' and the flow of urine as involuntary, resulting from overflow expelled to relieve the distension of the organ. But a small quantity of urine, compared with what is often retained by the distended bladders of patients with prostatic hypertrophy, suffices to produce distension of the small and thickened bladder which generally accompanies stricture; hence it does not follow that much if any dullness on percussion will be found above the pubes, in some of the cases which belong to the category now described.

**Chronic Abscess and Fistulæ.**—As a result of inflammatory action in the tissues bordering upon the affected part of the urethra, suppuration frequently occurs, and abscesses result, already described in the chapter on the pathological anatomy of stricture. A circumscribed tumour, not generally productive of much inconvenience at first, though occasionally giving rise to fits of shivering, appears in some part of the perineum, and after a long and tedious increase in size becomes very painful, reddens, and bursts by a small opening; matter is discharged, and the urine follows sooner or later, in greater or less quantity, and thus a urinary fistula is formed, which affords partial relief for a time to some of the inconveniences of the stricture, and is in fact nature's mode of relieving it. Additional fistulæ succeed, and the whole scrotum and perineum may become drilled with openings; they may also appear in the thighs, nates, or among the muscles of the pelvis. Meantime all the tissues around become thickened, and hardened by interstitial deposit thrown out in the long-continued inflammatory process, and now the urine passes in quantity, sometimes altogether, through the unnatural channels. But in some cases the commencing abscess seems to remain stationary, or subsides without breaking, and reappears or not at a future time. Much depends on treatment of the stricture; if that is removed by proper means in course of time the threatened abscess disappears. And there is reason to believe that many such abscesses are occasioned by inflammation in the neighbouring parts, without direct communication with the urethra, at all events at the outset of their progress; a condition constantly observed in the ischio-rectal fossa, where abscess results from rectal irritation, but in which there is no communication with the bowel at the outset. Indeed it often happens, as already intimated, that when a collection is opened in the perineum pus only issues; after a few days a drop of urine may appear, and then urinary fistula is established.

**Rupture of the Urethra.**—But a condition of greater danger to the patient may suddenly appear, as the result of retention of urine, and a lesion in the urethra behind the stricture. During an attack of complete inability to pass urine, while he is vainly endeavouring to do so both by voluntary efforts and by that severe straining which is to a great extent reflex and involuntary, and of which the distended bladder is the exciting cause, sudden relief is afforded. The patient is aware of sudden relief to the terrible distension, but soon becomes conscious that something has given way, while still no water flows by the urethra. Bodily exhaustion, and satisfaction at even momentary respite from the agonies he has endured, perhaps combine to induce rest and sleep. But a short time suffices to render obvious enough the catastrophe that has taken place. The urethra has given way behind the stricture either from rupture of its previously thinned or ulcerated walls, or by the bursting of the walls of an abscess in connection with it, and the pent-up urine is driven through the wound, penetrating rapidly the cellular structure in every direction, where it is not limited by fascial partitions, distending the scrotum and penis often enormously, breaking up the cellular connections and rendering the death of large portions of integument and subjacent tissue almost inevitable. The attack is usually attended with rigors and depression; and if the distended parts are not relieved by free incisions, the fluid rises above the abdomen, and may even reach the thorax, from the continuity of the cellular tissue in which it is effused. At first, livid discolorations, and then dark gangrenous spots appear, accompanied by increased symptoms of failing power. If this condition continues the pulse is feeble and intermittent; the surface is covered with cold perspiration; the patient becomes delirious, then comatose, and death closes the scene. On the other hand, if ample means of exit are afforded to the urine, and the powers of nature are well supported subsequently, the recovery from far advanced extravasation appears sometimes marvellous.

**Rupture of the Bladder.**—But the occurrence of a still more alarming consequence is possible, as a result of unrelieved distended bladder. The viscus itself may ulcerate and give way, and its contents be poured out in the cellular tissue of the pelvis, and that which lies beneath the peritoneum, or into the peritoneal cavity itself. True, this is happily a very rare event; still it has occurred, and it need not be added that the severest form of peritonitis follows, and rapidly proves fatal. Its rarity of occurrence, except as the result of direct violence, may be deduced from the fact that there is only one specimen of ruptured bladder from retention of urine in the Museum of the College of Surgeons, and that not caused by stricture. It took place in a woman.[1]

**Constitutional Effects.**—Thus far our attention has been chiefly directed to the local symptoms of stricture. But since extensive sympathies exist between the urinary organs and the constitution at large, this affection, if long continued, is rarely unaccompanied by general as well as local indications of its presence.

Thus, there is usually more or less disorder of the digestive organs, with its various concomitant symptoms, followed in time by the consequences of impaired nutritive function. The patient becomes wan, loses flesh and strength, looks anxious and careworn, depressed and listless, or extremely irritable, complains of pains in the back and loins; is sometimes subject to attacks of shivering, followed by perspirations, and bearing some resemblance to ague.

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[1] Preparations illustrative of ruptured bladder from stricture may be seen in Guy's Hospital Museum, No. 2,090; St. George's Hospital Museum, S. 21.

There are some patients, the subjects of stricture, who often experience rigors when an instrument has been passed, especially if it is a number larger than the accustomed size; in some instances, without any apparent exciting cause, particularly with those who have long inhabited warm climates, these attacks are prone to occur. The application of an irritant or corrosive substance to the urethra is also not uncommonly followed by some general fever. So well known and characteristic is this phenomenon, that it has received the special name, and not inappropriately, of 'urethral or urinary fever.' Under the latter term it will be considered in chapter xiii., to which the reader is referred.

Pains, apparently unconnected in any way with the seat of the disorder, are occasionally found to be co-existent with stricture; thus, pain in the sole of the foot long complained of has been referred sometimes to this cause, and is said to have led to the discovery of the urethral lesion. Neuralgic affections of the thighs, and of other parts of the body, sometimes appear to have a similar connection with it.

Further, it will be unnecessary to do more than state, without entering into details, that the local and general signs of inflammation of the bladder, or of other portions of the urinary apparatus, may be presented in those cases in which such conditions have supervened on organic stricture, and which are sometimes found arising from it. As regards disease of the prostate depending on stricture, chronic inflammatory enlargement, with abscess, may be thus caused. It may not be superfluous to add, that the hypertrophy of the organ met with in elderly people is not occasioned by urethral stricture, nor is it influenced in any way by this last-named complaint.

**Pathological Classification of Stricture.**—From a review of the symptoms which accompany organic stricture, I think we may constitute three classes of the disease, which will embrace all its varieties, and so serve as a means of describing in brief terms any particular example. It is founded, not on anatomical characters, which are appreciable only to the morbid anatomist (*vide* chapter ii. page 29), but on pathological phenomena, and so is available for useful purposes during life. Already mentioned in the preceding chapter, it has found its exposition in the present one, and may be appropriately placed here.

### *Classification of Organic Strictures, according to their Prominent Pathological Tendencies.*

I. SIMPLE STRICTURE:

The chief sign of its presence is diminution in the size of the stream always manifest, but varying in degree: there is sometimes increased frequency of micturition also, although the amount varies greatly in different cases, it is not observed, as a rule, during the early stages.

II. SENSITIVE OR IRRITABLE STRICTURE:

Proneness to disturbance of the nervous system, as evidenced by chilliness, irregular circulation, or even rigors on very slight irritation. The application of instruments, however gently made, often causes considerable pain, which sometimes continues long afterwards; and inflammation may follow, not unlikely to reach and affect the bladder. In a few cases, also, bleeding readily takes place.

III. CONTRACTILE OR RECURRING STRICTURE (resilient of Syme):

All strictures have a constant tendency to become narrower, or less dilatable, in the absence of mechanical treatment: when this disposition is unusually marked; and the narrowing rapidly reappears after dilatation; or when obstinate inability to pass water is often present, although the calibre is not necessarily very small; the case belongs to this class.

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## CHAPTER IV.

### CAUSES OF ORGANIC STRICTURE.

THE causes of organic stricture. This subject has not been sufficiently investigated; at all events, very dissimilar opinions have been expressed respecting it by different observers of eminence.

I shall endeavour to elucidate the subject more fully, and to explain these discrepancies: first, by quoting the views of authorities of note; and secondly, by adducing the result of other researches made in order to determine the question.

John Hunter 'doubts very much if stricture commonly or ever arises from the effects of the venereal disease, or from the method of cure.' He further says, 'Strictures are common to most passages in the human body; they are often to be found in the œsophagus, in the intestines, especially the rectum, in the anus, in the prepuce, producing phymosis; in the lacrymal duct, producing the disease called fistula lacrymalis, where no disease had previously existed. They sometimes happen in the urethra where no venereal complaint had ever been. I have seen an instance of this kind in a young man of nineteen, who had had the complaint for eight years, and which, therefore, began when he was only eleven years of age, It was treated first as stone or gravel. He was of a scrofulous habit, the lips thick, the eyes sore, a thickened cornea of one eye, and the general habit weak. This stricture was in the usual place, about the membranous part of the urethra.'[1]

The great pathologist, however, stands almost alone in this opinion.

Thus, Sir A. Cooper says: 'As to the manner in which stricture is produced, I am opposed on this point to Mr. Hunter, one of the greatest surgical authorities that ever lived; and, if asked what was the cause of stricture, I should say, in ninety-nine cases out of every hundred, it was the result of gonorrhœa . . . or of any excess when the patient is labouring under that complaint.'[2]

Sir E. Home says: 'There are so many instances where the symptoms of stricture have been immediately preceded by a severe gonorrhœa, from the effect of which the membrane had never recovered, that there has long been little doubt in my own mind of gonorrhœa being a very general cause of strictures.'[3]

Mr. Abernethy believes: 'That gonorrhœas are very liable, if they be improperly treated, to lay the foundation for stricture.'[4]

Sir Charles Bell: 'The most common cause of stricture is gonorrhœa; still the specific inflammation is not always the occasion of it. . . . So constantly is inflammation the forerunner of stricture, that it may be held a point as well established by evidence, that the origin of all strictures in the urethra is in consequence of inflammation, as that adhesions of the pleura are produced by it.'[5]

Sir B. Brodie: 'It may sometimes be traced as the consequence of a severe and long-continued attack of gonorrhœa.'[6]

Sir W. Lawrence says: 'That stricture is produced by a change of structure in some part of the canal, consequent upon effusion produced by inflammation, or on the cicatrization of an ulcerated surface. . . . And undoubtedly the most frequent cause is gonorrhœal inflammation.'[7]

Mr. Liston: 'Stricture of the urethra arises most frequently from specific inflammation, or gonorrhœa of long standing, probably neglected, or ill-treated and aggravated during the first stage by acrid stimulating injections and free living.'[1]

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[1] *Hunter on the Venereal Disease*, 2nd ed. pp. 166–7.

[2] Surgical Lectures, reported in the *Lancet*, vol. iii.–iv. p. 222.

[3] *Practical Observations on Treatment of Strictures*, &c. 3rd ed. vol. i. pp. 33–4.

[4] Surgical Lectures, reported in the *Lancet*, vol. vi. p. 323.

[5] *Treatise on Diseases of the Urethra*, &c. 3rd ed. Shaw, pp. 106–7, 1822.

[6] *Lectures on Diseases of the Urinary Organs*, 4th ed. p. 2.

[7] Lectures reported in the *Lancet* (No. 76 Lecture), Aug. 14, 1830.

Chelius: 'Stricture is frequently observed after gonorrhœa, especially if that have been long continued and improperly treated. The causal relations, however, which the stricture has to a previous clap, are often unknown, as it is observed after both severe and slight clap, whether treated with or without injections.'[2]

Ducamp says: 'If we carefully question a patient, we shall find that he has had one attack of gonorrhœa, or more, but that the attack occurring last before the appearance of the stricture was very chronic.'[3]

Civiale discusses the subject of 'Urethritis' as a cause, at some length, and states it to be his opinion, that 'it ought to be placed in the first rank in the list of causes.' He then asserts that this affection *may* never have been acute, but chronic at its commencement, and not necessarily following impure, or even, indeed, any sexual connection. He enumerates other and less obvious causes, such as, 'abuse of instruments employed in affections of the urethra,' 'violence applied to the perineum,' 'arrest of calculi in the urethra,' 'perineal section,' and 'abuse of coitus and prolonged erections.'[4]

Leroy D'Etiolles says: 'All that produces inflammation at the extremity of the urethra is a cause of stricture. Gonorrhœa is to be placed in the first rank. . . . Old and obstinate discharges in particular, which in time produce ulcerations, leave the germs of stricture after them. To prevent these ulcerations by stopping the discharge at the outset, is, in appearance at least, to act in a rational manner. Astringent injections appear then to be rather a preventive than a cause of strictures.' But on the following page, he recognizes 'injections which are too irritant,' as producing strictures and other disorders.[5]

It will be observed, that all the foregoing extracts are statements of opinions founded upon the general experience of the writers, but not established by researches specially directed to that end, such as by any comprehensive analysis of a large number of cases, with an endeavour to estimate the respective influence of various causes in the production of stricture, as indicated by their proportionate numerical relation. To the attainment of the latter object my own attention has been especially directed. For this purpose I carefully collected and arranged 220 cases, of which 143 are those of hospital in-patients, admitted for the cure of stricture, or of its effects, retention of urine and the like, taken from the case-books of University College Hospital, many of which have come immediately beneath my own care and observation, and the particulars of which possess the highest degree of authenticity. A second portion, forty-nine in number, is formed by the most carefully written reports which have appeared in the journals containing the required particulars, almost all of which are hospital cases also. It will therefore be seen, that these 192 examples of stricture are not specimens of the average, but of the worst forms of the disease, inasmuch as the milder forms rarely enter such institutions, but are treated as out-patients. To estimate them aright, they should be regarded as, for the most part, illustrative of the disease when aggravated by the consequences of neglect, debauchery, or privation, to an extent not commonly met with among the middle classes.

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[1] *Practical Surgery*, 4th ed. p. 467.

[2] *Chelius*, translated by South, vol. ii. p. 355.

[3] *Ducamp's Traité des Rétentions d'Urine*, &c. Paris, 1822.

[4] *Traité pratique sur les Maladies des Organes Genito-urinaires*. Paris, 1837. Tom. i. pp. 152–157.

[5] *Des Angusties ou Rétrécissements de l'Urètre*, &c. Paris, 1845, pp. 67–9.

The remaining twenty-eight cases are different in their character, and are for this reason appended; some of them being examples of causes, almost peculiar to that class of patients in which they are found, viz. in the middle and upper ranks of society, which came beneath my own observation. So that we may regard the table given in the Appendix as affording material for an accurate estimate of the characters of the disease in relation to its severity and consequences, and of the nature of its exciting and predisposing causes.

The facts obtained in these cases are as follow: The patient's age. —Number and dates of any gonorrhœal attacks or other lesions. If the former, whether the discharge continued for a long period of time, or otherwise (in as many cases as this information was obtainable).—Date of first discovery of stricture.—Brief detail of subsequent symptoms, and present condition. These points are noted in five columns, so that a short but comprehensive history of each case is presented to the eye, and the main facts may be observed at a glance. (See table at the end of Appendix.) This table is analyzed, and the entire results brought into one page at the close of this chapter.

From a consideration of these cases the causes of organic stricture may be arranged under four heads, as follows:

### *Causes of Organic Stricture.*

I. INFLAMMATION OF THE URETHRA and surrounding tissues.
    1. Specific or gonorrhœal, acute and chronic.
    2. Inflammation arising from non-specific causes.

*Local Non-specific Causes:*

- α Secretions from the female passages, not specific, as the menstrual fluid, &c.
- β Abnormal conditions of the urine, and adventitious matters contained in it (?)
- γ Excess of venery (?)
- δ Injections (?); caustics.
- ε Abuse of instruments.

*Constitutional or Idiopathic Causes* (?):

Inflammation, simply catarrhal, or depending upon scrofula, gout, and rheumatism.

II. CICATRIZATIONS AND ADHESIONS, following—

1. Chancres in the urethra.
2. Simple ulcers, and the openings of abscesses, and fistulæ.
3. Wounds caused by blows on the perineum, punctures; lacerations from horse exercise. Chordee. Abuse of instruments, blunt and cutting. Passage of calculi. Operations upon the urethra from the perineum causing sloughing. Amputation of the penis.

III. GROWTHS IN THE URETHRA.

Florid granulations.
Polypoid formations.
Tubercular and malignant deposits.
These produce organized obstruction of the urethra, but not 'organic stricture' in the exact sense of the term.

IV. CONGENITAL MALFORMATIONS NARROWING THE CANAL.

As seen above, inflammatory action in the urethra is most unhesitatingly placed, first and foremost, among the causes of organic stricture, whatever be its source or origin. There is no fact which may be conceived to be better established than this.

### I. The Specific or Gonorrhœal Inflammation.

The relation which an inflammation of the urethra bears to a subsequent organic stricture, is much the same, whatever be the exciting cause of the attack. I shall accordingly endeavour to trace that relation in this place, intending the remarks to possess a general application, and to be borne in mind equally in the consideration of the various classes which will follow hereafter.

The connecting links of that relation are not always very obvious or easy to be traced. Hence their existence has been denied by some writers, and among them Hunter's name has generally been classed.

Not admitting 'the venereal' disease as a cause, Hunter appears to have accounted for the existence of stricture by supposing a tendency to its production to be inherent in canals generally, stating that '*stricture is common to most passages in the human body . . . where no disease had previously existed*,'[1] and citing stricture of the œsophagus, intestines, lacrymal ducts, &c. as examples. Modern pathology, however, will not bear out the correctness of this assertion, nor accept of it, or of any supposed disposition to contract, as sufficient to account for strictures, either of the œsophagus or of the intestine. Besides the analogy which is assumed to hold good between them is imperfect and deceptive. A classification of 'all the passages of the body' in one category, that is to say, the mere fact of their being 'passages,' by no means proves that they are alike susceptible of the same morbid influences, or are liable to present the same morbid conditions. They greatly vary, alike in structure, in function, and in relation to surrounding circumstances. Take the intestine as an example, the function of which is displayed by continuous contractions of its muscular parietes, in order to facilitate the passage of their contents. Paralyse that action, and obstruction is produced. Is not the very reverse of this the rule in stricture of the urethra, whatever be its cause? Relaxation of the muscular fibres, as we have before seen, is the necessary condition to a free transit through it, and the action of its muscles closes the passage. True, in both cases, obstruction may be caused by undue contraction of the muscles, although the phenomenon is probably excessively rare as regards the intestinal tube. It is certainly sometimes narrowed by the cicatrization of ulcers following inflammation, as in dysentery, and after typhoid fever, &c.; so shall we hereafter see is the urethra. It is narrowed often by growths into its cavity, which are most frequently malignant in their character. This is also true of the urethra, in which, however, they are much more rare.

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[1] *Hunter on the Venereal Disease*, p. 167. Quoted at length, p. 62.

Perhaps the general application of the term STRICTURE to affections which are so greatly unlike each other in their nature, may have given rise to attempts to generalise respecting them, and to seek analogies respecting them which do not exist. What similarity, for example, is there between that narrowing of the urethral passage which results from the contraction of inflammatory products around it, and the occlusion of the œsophagus or rectum by cancerous growths? Yet both affections are conventionally known as stricture. It has been remarked by some writer that all canals possess a certain natural inherent liability to become contracted at some point near to their orifices. But this fact arises simply from these being necessarily the portions most exposed to injury, whether from external violence, or in the exercise of an expulsive function, and consequently strictures so resulting are in this sense only, common to the orifices in all. Thus in the urinary passages we find the ureters, comparatively speaking, very rarely narrowed, while the urethra most frequently becomes so, as being infinitely more obnoxious to attacks of inflammation, as well as to the receipt of blows and lacerations. So in the alimentary passages, the pharynx and œsophagus incur the dangers of exposure and become strictured from the effect of contact with corrosive substances. At the anal extremity various circumstances give rise to lesions peculiar to the neighbourhood of that orifice; while many causes of chronic inflammation act on either extremity of the canal from their liability by situation to external influences, which do not affect internal parts.

But I am inclined to think that Hunter has been partly misunderstood and misrepresented in this matter. While it must be confessed he does not recognize 'gonorrhœa' as a cause, he appears to direct his application of the term mainly to its, at that time, supposed specific character, for he says, page 160 of the work before quoted, 'If any of these diseases,' meaning chiefly strictures, 'arise from a gonorrhœa, they are most probably not the consequences of any specific quality in the venereal poison, but are such as might be produced by any common inflammation in those parts, as was observed of the continued symptoms.' And such is precisely the doctrine here contended for.

Let us now consider what amount of connection may be traced between urethral inflammation and organic stricture.

A man has an attack of gonorrhœa; if the treatment be tolerably judicious, and if he be careful and temperate, even for a short time after all signs of the disorder have disappeared, no evil results are generally to be apprehended. A second and a third may be acquired afterwards, which, with similar care, will probably pass off, and leave the patient unscathed, unless certain marked tendencies in the system exist which dispose to a form of inflammation which is productive of stricture.

For there is no doubt that in certain constitutions a single and mild attack of gonorrhœa is almost certain to occasion organic narrowing of the urethra: illustrations of this have occurred to me in meeting, in the same family, with three or four examples of the complaint, and in circumstances where it was not severe, and was not neglected. In other families two or three individuals incur severe and repeated attacks, and are free from any trace of stricture subsequently. In most of the cases in the table, it is clear that the attack continued to be chronic, often neglected no doubt; sometimes a second or a third attack was acquired before the first had disappeared.

As a rule it will be observed that a period of three or four years elapses before the patient notices that the stream of urine has diminished in size, although he may have remarked some irregularity in the form of the jet; sometimes, indeed, being unduly impressed with the supposed importance of a twisted stream. If he is careless in his habits, and indifferent to slight deviations manifested in the performance of his daily functions, he may overlook the early signs of his complaint, and an attack of retention may first announce the presence of stricture, after which the ordinary symptoms become invariably more urgent.

But in many instances the interval of time between the inflammation and the appearance of the symptoms has been exceedingly small, apparently only four or eight weeks. In such it may be assumed that no interval has really existed, for it must be obvious that the first and slightest degree of urethral contraction can scarcely be regarded as appreciable by the patient. Then, on the other hand, there seem to be examples in which perhaps twenty years have elapsed without obvious symptoms. Does any relation exist in the way of cause and effect in such cases?

There can be little doubt that, after numerous attacks of acute urethritis, a permanent predisposition to congestion and some degree of chronic inflammation will in some cases continue long afterwards. Slighter causes than the original excitant of the first attack suffice to arouse and maintain an inflammatory condition of the mucous membrane. Anything which renders the urine irritating, or some other source of local irritation; or external cold producing internal congestion; such circumstances will long maintain a condition in which the occurrence of an exciting cause, which would be harmless when acting on a healthy urethra, will, in the cases supposed, give rise to exudation of plastic matter into the tissues about the tube afterwards, gradually producing contraction and narrowing the urethra. A free habitual use of stimulants is probably favourable to the continuance of subacute inflammation.

A remark is frequently made that may not pass unnoticed here. It is said, if gonorrhœa be a cause of stricture, how is it that while the anterior part of the urethra is chiefly affected by that inflammation, the most frequent site of stricture is from about three to five or five and a half inches from the external orifice? Gonorrhœa, considered as an acute inflammation of the anterior three or four inches of the urethra, is, indeed, not very often a cause of stricture; and a very large majority of gonorrhœas are not followed by it. But in certain constitutions, or, indeed, in any, when neglected or badly treated, it most assuredly is so. If the inflammation, instead of disappearing in the course of four or five weeks from the period of its accession, long continues, it gradually extends backwards to the bulbous portion, and, in a degree which may be termed subacute, lasts there for many months, occasioning a slight discharge, which continues in spite of treatment. Injections may have been properly employed, as far as the application can be fairly made, which is seldom more than four or five inches down the urethra; but beyond that point the morbid state continues, and treatment is rarely brought to bear upon it. Hence instruments are used with beneficial effect, for carrying injections farther down the canal to stop an old gleet, which would give way to no other remedy. It is the prolonged existence of subacute inflammation, rather than the primary gonorrhœa itself, affecting the bulbous part of the canal, where the morbid action is perhaps favoured by great vascularity of the tissues, as already pointed out (see p. 48), which is to be regarded as the cause of that deposit, in and beneath the mucous membrane, which, by its subsequent contraction, so commonly produces stricture.

THE LOCAL NON-SPECIFIC CAUSES enumerated in the table at page 64, need no elucidation here. The effects of all, in relation to the production of stricture, arise solely through one mode of action, viz. chronic inflammation, the agency of which has already been fully described. Anything which occasions this may be placed in the list referred to.

THE CONSTITUTIONAL OR IDIOPATHIC TENDENCIES may be regarded sometimes as proximate, but generally as predisposing causes.

Some individuals are much more susceptible of inflammation of the mucous membranes than are others. Observation leads us in some instances to connect this predisposition with the presence of some morbid habit of body, perhaps with a liability to attacks of gout and rheumatism. That tumid condition of the Schneiderian membrane, of the lining of the throat, of the internal ear, and of other parts, so commonly found in so-called scrofulous subjects, and often accompanied with considerable mucous or mucopurulent discharges, has been supposed to have its analogue in a similar affection of the bladder and urethra also. The case cited by Mr. Hunter, in proof of his statement that strictures are not often caused by gonorrhœa, was doubtless a case of this kind. It was purposely quoted at page 62. A youth nineteen years old, of strumous habit strongly marked, had suffered from urinary disorder for eight years, had been treated for 'stone or gravel,' and had now a stricture at the membranous portion of the urethra. It is possible that this latter might have been connected with that state of constitution of which other signs were manifested by local complaints elsewhere. There appears to be a tendency strongly marked in some individuals to irritability of the urinary organs, displayed first in early life, of which no precise explanation is offered, but which has been sometimes observed to precede the formation of stricture in adult age. The subjects of it may or may not suffer as children from incontinence of urine during sleep. At all times they micturate more frequently than others do; and the urine is sometimes discharged in a smaller stream than natural. In time the habit of wetting the bed is exchanged for that of rising to make water twice or three times in the night. More than the ordinary amount of effort is made in order to expel the urine, and the difficulty experienced is greater at one time than another. If such individuals acquire a gonorrhœa, the attendant symptoms may be more than ordinarily severe and distressing, and stricture is not unlikely to follow. These cases seem to be examples of congenital irritability of the urinary apparatus; they require attention and care in early life, and will be mostly benefited by improvement of the constitutional powers, as well as by paying particular regard to the skin and insuring the activity of its functions. As already stated, there is some peculiarity in the constitution which determines the occurrence of stricture, as a sequence of inflammation, in some persons, which appears not to be present in others. Thus I have several times noted, that the disease appears in families; an example occurred of three brothers in one family who were personally known by me to be affected in a marked degree. Such a fact is too remarkable to be regarded as having no other relation than that of coincidence.

The influence of gout and rheumatism upon the urethra will be considered in connection with the subject of spasm. Rheumatism of the muscles of the perineum is said to be sometimes a cause of stricture, an assertion which is quite unsupported by proof.

**II. Cicatrizations and Adhesions.**

When in the healthy living body any solution of continuity has occurred in the soft parts, occasioning loss of substance, the ultimate result of granulation and healing is contraction of the new tissue forming the cicatrix. As reproduction of the lost part cannot take place, diminution of volume in some direction must follow. Examples of this process are daily seen in the cicatrices following external burns, ulcers, &c.

Now the same thing happens in internal parts also. Loss of substance in the mucous membranes, as well as in the skin, is followed by a similar reparative process, and by the deposit of the same contractile material, so that it is common to find narrowing of a mucous canal caused by this action following an ulcerated condition of the part. Thus the urethra is sometimes contracted, as we have the opportunity of seeing when the ulceration has chanced to occur, either directly at the external orifice, or within a very short distance of it; a not unfrequent occurrence.[1] Some years ago, at the Hôpital du Midi, in Paris, I saw a remarkable case of single chancre involving the entire external meatus, which was leading to, and would inevitably result in, stricture of the orifice, and a sketch of it was sent to the College in the portfolio of drawings which accompanied this essay. Since that time I have seen numerous cases in which ulceration of the meatus has produced stricture. But chancres may be found within the canal as well as at its orifice, in the former case giving rise to a discharge which, although at the time supposed perhaps to be merely gonorrhœal, has been at some subsequent period followed by secondary syphilis in some of its forms. A cicatrix remaining may contract and narrow the canal, but such an occurrence is rare. Ulcerated surfaces may, moreover, heal by adhesion; the mucous membrane of the urethra is, as we have seen, disposed in rugæ closely applied to each other, and from their continuing so constantly, except during the act of micturition, these may be supposed very readily to become united with each other. I have observed longitudinal puckerings of the membrane whose appearance has been strongly suggestive of this mode of formation.

On the other hand, a chancre at the orifice of the urethra, so far from producing contraction, may occasion a considerable enlargement of the orifice by occasioning sloughing of the soft parts.

The urethra is susceptible of the ordinary abrasions and ulcerations, and may also sustain injury by a variety of mechanical causes. The discharge of matter from an abscess into the urethra has been followed by symptoms of stricture, from the destruction of mucous membrane, healing of the orifice, and subsequent cicatrization.

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[1] See Prep. No. S. 78, in Museum of St. George's Hospital.

Blows on the perineum, lacerating the urethra, often cause stricture in its worst form. These are received in many ways. Among sailors severe cases are sometimes met with: a man falls from the rigging of a vessel, and alights, with his legs apart, across a spar or some similar object. Hæmorrhage from the meatus, sometimes very considerable in quantity, shows that the urethra has been injured; probably retention occurs; and instruments can rarely be used to relieve it, without the hazard of inflicting some additional laceration. Usually, in the course of a few weeks, symptoms of stricture appear; and, ere long, the patient is afflicted with an unyielding, tight, and obstinate stricture.

A fall, without a direct blow on the perineum or adjacent parts, may lacerate the urethra. Some time ago I met with an instance of stricture caused by a fall from a high scaffold; the individual alighted on his feet widely separated from each other, no blow being received upon the perineum; but the usual symptoms of lacerated urethra followed.

The same lesion is produced in many other ways, as by the slipping of the feet through ladders, falls upon carriage-wheels in the act of mounting or dismounting, &c.; or the canal may be lacerated or cut across in punctured and other wounds, and thus may be altogether obliterated. Children thus occasionally suffer by the breaking of earthenware utensils beneath them. Adults meet with similar injuries by falls on palisading; in the country by crossing fences, from pointed stakes, and the like. Several instances of all these causes have come under my notice as giving rise to obstinate stricture. Injuries, in which fractures of the pelvic bones occur, are liable to cause laceration of the urethra. Miners, and others engaged in excavations, are obnoxious to accidents of this kind, as from the fall of a bank of earth upon them, &c. In hard riding and leaping, as in hunting, a blow from the pommel of the saddle will produce the same result. But less severe horse exercise also may be a source of injury by maintaining pre-existing inflammation; and it may be observed as the result of training among cavalry soldiers.

Laceration of the urethra has perhaps been occasionally produced by violent chordee, sometimes occurring spontaneously; sometimes, it is said, arising from efforts to 'break the chordee' resorted to by the patient himself, in order to effect its cure. Violent hæmorrhage has relieved, for the time, an obstinate chordee, soon after which signs of stricture have gradually appeared. It is not improbable that in such cases the urethra has been ruptured, and the erectile tissue of the corpus spongiosum itself lacerated; hence an intractable stricture is prone to result at no very remote period.

The application of instruments in the treatment of urethral disease is sometimes an agent in the production of stricture. It is impossible to insist too strongly on the employment of the greatest care, tact, and delicacy in the management of sounds and catheters in the urethra; and the habit of passing them roughly and unnecessarily cannot be too strongly reprobated. Worst of all is the employment of force under circumstances of retention or narrow stricture, in which cases the care, gentleness, patience, and forbearance of the operator should be manifested just in proportion to the obstacles and difficulties which have to be encountered. The temptation to use force is very strong, especially to one who is inexperienced in the practice of catheterism. Nothing can be more dangerous, at all events in his hands. The history of many a case demonstrates that the aggravation of the symptoms experienced after each succeeding attack of retention, has been due to the harsh usage the urethra has been made to undergo at these periods, in the form of reiterated attempts to pass a catheter, first by one hand, then by another, and afterwards, perhaps, by a third; each, probably, over-emulous to become the successful operator.

It is difficult to exaggerate the evil consequences of forcible catheterism, and of the unnecessary employment of very large bougies in cases of simple stricture. An examination of numerous preparations of the disease in Museums, showing numerous false passages, may suffice to warn the young surgeon of the irreparable mischief he may in one short minute inflict by a transient loss of temper, or forgetfulness of the golden rule in catheterism, '*arte non vi.*'

Division of the urethra from the perineum or elsewhere, not being sufficiently treated by dilatation afterwards, may be followed by irregular adhesion of the cut surfaces, and thus by some constriction of the passage, but not otherwise. The section made in the lateral operation of lithotomy has been observed to cause stricture in one or two instances, on the authority of an American surgeon. This must be a very rare event, for I have never met with it as a cause. Admitting the cases mentioned, its very exceptional occurrence proves how constant is the rule, that lithotomy does not reckon stricture among its consequences.

Amputation of the penis by the knife, or loss of a portion of the organ by phagedænic ulceration, or cancer, is likely to be followed by an intractable narrowing of the orifice of the urethra, unless carefully and constantly provided against, either by operative measures or by dilating at a sufficiently early stage of the case; and then the opening is still liable to contract. Of cancerous ulceration affecting the penis and causing narrowing of the canal, there is a preparation in the Middlesex Hospital Museum (No. XI. 27).

**III. Growths.**—This subject has been fully discussed under the head of the 'Pathology of Organic or Permanent Stricture,' pages 41 *et seq.*

**IV. Congenital Impediments.**—Narrowing of the meatus sometimes occurs as an error of formation; sometimes, also, as a complication of congenital phymosis. Such contractions may be situated either at the orifice or at any distance from it, along the course of the canal, varying from a quarter to three-quarters of an inch. In almost all cases the obstruction consists of a simple fold of membrane, stretching across it to a greater or less extent, and generally arising from the floor of the urethra. When congenital hypospadias exists the orifice is almost invariably small.

The following analysis of the table referred to is subjoined, showing the connection which exists between a gonorrhœal attack and a subsequent stricture.

### ANALYSIS OF 217 CASES OF 'STRICTURE' FORMING TABLE AT THE END OF THE APPENDIX.

#### *Antecedents, or supposed Causes of Organic Stricture.*

| | |
|---|---|
| *Gonorrhœal Inflammation* in . . . . . . . . . . . | 164 |
| *Injury to Perineum* . . . . . . . . . . . . . | 28 |
| *Cicatrization of Chancres* . . . . . . . . . . . | 3 |
| Ditto following *Phagedæna* . . . . . . . . . . . | 1 |
| *Congenital*, including cases in which the urethra may have been small from malformation, and those in which marked irritability of the urinary organs existed from childhood, accompanied by an unusually small stream . | 6 |
| | 202 |

#### *Obstruction more or less Transitory, but offering Conditions resembling Stricture.*

| | |
|---|---|
| '*Inflammatory Stricture*,' including *Temporary* Stricture and Retention from a sudden acute inflammation, usually caused by some excess, and disappearing by resolution . . . . . . . . . . . | 8 |
| '*Spasmodic Stricture*,' caused by irritations about the rectum . . . . | 2 |
| ,, ,, No cause assignable . . . . . . . | 2 |
| ,, ,, Caused by undue acidity and alkalinity of the urine . | 3 |
| | 15 |

Respecting the first group of cases the following facts are elicited:

Of the . . . . 164 cases attributable to Gonorrhœa,

In . . . . 90 the disease is reported to have been *chronic or neglected.*
In . . . . 3 it was attributed by the patients to strong injections.
In . . . . 6 the discharge is stated to have ceased entirely and rapidly under treatment; but in 5 of these stricture appeared almost immediately after.

| | |
|---|---|
| In . . . . | 4 other cases the stricture appeared to be almost simultaneous with the gonorrhœa. |
| In the remaining . | 61 there is no report of chronicity, &c. |

Of the 164 cases attributable to Gonorrhœa,

| | | |
|---|---|---|
| 10 | appeared | immediately after or during the attack. |
| 71 | ,, | *within* 1 year of its occurrence. |
| 41 | ,, | *within* 3 or 4 years. |
| 22 | ,, | *within* 7 or 8 years. |
| 20 | are reported | at periods between 8 and 20 to 25 years. |

# CHAPTER V.

## OF SPASM AND INFLAMMATION AS CAUSES OF URETHRAL OBSTRUCTION.

It may have been observed that in detailing the local symptoms of permanent stricture, an allusion was made to the fact that the size of the stream of urine frequently varies; and that a patient often relates of his own accord, that although the current is always considerably smaller than it formerly was, yet, 'that it comes much more freely on some days than on others.' Such variation is not uncommon in health, and it occurs also in the presence of stricture. The solution may be found in various circumstances; for example, when the bladder is full, and the pressure is therefore considerable, the stream is generally notably fuller than when there is only a small quantity in the bladder, and the pressure which propels the outward flow is small. But the temporary and changing conditions of the urethra itself exert an influence on the stream. There are certain anatomical conditions which may affect such temporary changes, which have now to be considered.

Thus we now know by demonstration that which had been long suspected by many observers, viz. that a portion of the urethra already narrowed by some plastic deposit, is liable to be temporarily constricted by the action of the involuntary muscular fibres which surround the canal at all points. And it appears probable that this constriction may be the result of some irritation of the sentient nerves of the part, transmitted by them to a nervous centre, which, according to their connections, may be either the spinal cord, or some ganglion, which reflects the impulses of the nerves in question to the motor branches, by whose agency contraction of the muscular fibres is induced.

This irritation may occasionally be traced to abrasion of the mucous membrane at the strictured part, or to its exalted sensibility only, so that an increase in the acidity or acridity of the urine in some patients appears to be a sufficient cause of excitement to the reflex act described. Thus the presence of a foreign body, as of a small calculus, of a sound, of injections, &c., may tend to cause reflex contractions in a greater or less degree, corresponding with the amount both of local and general nervous mobility, which mark the particular constitution of the patient.

Then certain general conditions of the system also, as they influence the state of all the muscular fibre throughout the body, must of necessity affect these muscles in particular. External cold or heat produce effects opposite in their character; an attack of general rigors being attended with a small stream, and the converse condition of the body, as when relaxed by heat, giving rise to a large one.[1] Internal vascular congestion is at the same time caused also, and probably has quite as large a share in producing these symptoms. We can, therefore, scarcely expect to find a case of organic stricture which does not occasionally experience to some extent the effects of spasmodic influence, and this statement observation corroborates.

These remarks naturally bring about the question which we have next to consider, viz. does spasm of the urethra occur, apart from the presence of some organic contraction of prior existence, however slight? As a rare occurrence, perhaps, this does happen, but in most of the cases attributed solely to spasm, some local lesion, however slight, exists. Still there are some examples in which the exciting cause does not appear to be explained only by supposing that cause to take its origin in some morbid condition of a nervous centre. To this category, without doubt, may be referred those cases which are described by some writers as examples of 'pure spasmodic stricture,' and which they regard as of extremely rare occurrence.

Thus, Sir B. Brodie says: 'Instances are not wanting of persons who have been for a considerable time liable to occasional attacks of retention of urine from spasmodic stricture of the urethra, although in the intermediate periods there was no perceptible diminution of the stream of urine, and hence we are justified in the conclusion that a spasmodic stricture may exist independently of any actual organic disease. At the same time it must be acknowledged that the existence of a purely spasmodic stricture is of rare occurrence.'[1]

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[1] The following is a typical example of common occurrence:

A policeman, who had been the subject of slight organic stricture for three or four years, related that he habitually went on duty early in the morning, and in the winter-time suffered much from cold; that the presence of his stricture was always much more apparent during that part of the day, but that when he had become thoroughly warm the difficulty in making water almost vanished. Shortly after, he had an attack of complete retention on one of these cold mornings, and the stricture has been narrower ever since.

Mr. Guthrie states, that he has only met with one such case.[2] Both refer the phenomena to spasm of the compressores urethræ muscles.

John Hunter directly states that 'there are often spasmodic contractions of these muscular fibres *in different parts* of the canal shutting up the passage and obstructing the course of the canal, and often not allowing a drop to pass.'[3]

Mr. Phillips says: 'Despite the contemptuous denial made by some authors, of the existence of spasmodic constrictions of the urethra, and of the obstacles which they present, spasmodic constrictions really exist, and ought to fix the attention of the surgeon. Occasionally, in the operation of catheterism on irritable subjects, we find that the sound is apparently grasped and held with force by the parietes of the canal, so as almost to prevent the advance or retreat of the instrument.'[4]

Mr. Hancock 'believes, in opposition to what has been advanced by Sir B. Brodie, that a spasmodic contraction of these organic fibres may take place in the anterior part of the urethral canal, even within an inch from the orifice, and also that it may exist as a primary and independent affection, without a spasmodic affection necessarily existing at the same time in the membranous portion.'[5]

It will be obvious from the above extracts, and also to anyone who has paid any attention to the literature of the subject, that while the occurrence of spasmodic narrowing of the urethra is generally admitted, yet there is a want of clearness of view respecting the pathological condition involved by that fact. As before seen, Sir B. Brodie and Mr. Guthrie, recognising in the existence of spasm the necessity for a muscular apparatus to produce it, at once refer it to the action of the compressor urethræ muscles, and therefore limit its occurrence to that small portion of the canal about three-quarters of an inch long, which lies between the two layers of the deep perineal fascia: while later writers are disposed to attribute influence to the unstriped muscles which encompass the whole course of the urethra. Lastly, some have referred the phenomena in question to a spasmodic action of the accelerator muscle, but I think it is to be doubted whether that muscle can exert any influence upon the calibre of the urethra; certainly its power must be very inconsiderable with so much erectile tissue intervening between the muscle and the canal.

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[1] Sir B. Brodie on the *Urinary Organs*, 4th ed. p. 6.

[2] Guthrie, *op. cit.* p. 45.

[3] Hunter, *op. cit.* p. 229.

[4] Phillips on the *Urethra*, p. 131.

[5] Mr. Hancock's Lettsomian Lecture for 1852.

To sum up: it may be regarded as sufficiently proved that the whole canal, being endowed with a contractile function, and with a sphincteric muscle which acts specially on one part of it, is capable of being temporarily narrowed to some extent in very unusual circumstances.

**1. Causes of temporary Narrowing of the Urethra through the Action of Muscular Tissues surrounding it.**—As before hinted, none is so common as partial organic contraction; that is to say, a permanent stricture being present, however slight may be its extent, the canal is liable to be narrowed at any time: hence the varying size of the stream in such patients, already alluded to. On the same principle, a similar action may arise when the mucous membrane is abraded by injury or otherwise. And these conditions may be intensified if the urine itself is of an irritating character by reason of its extreme acidity or acridity; a circumstance already alluded to.

Patients manifestly belonging to this category find no difficulty in micturition during seasons favourable to activity of function on the part of all the excreting organs, the skin especially, but if transpiration from the surface be checked the urine abounds in acid, and is loaded with urates which may appear in considerable quantity. In these cases the genito-urinary mucous membranes seem to possess, in common with the others, an extreme susceptibility to irritating influences, and the stream of urine may be considerably diminished in size, associated with unusual difficulty in micturition, and unnaturally frequent desire to perform it.

The examples referred to are rarely to be seen at hospitals, being found usually among those who feed too amply, or on too stimulating diet, and who at the same time are not in the habit of taking sufficient exercise for the attainment and conservation of health.

Under the head of altered urine, as a cause of spasm, are noted by various writers the effects upon it of cantharides, the turpentines (?), spices (?), condiments (?), &c., all of which may, it is said, through the agency of direct contact, irritate the canal and cause temporary constriction of it. It is supposed that the elimination of the active principle by the urinary organs may, by bringing it into contact with the mucous membrane, occasion the constriction.

I have hitherto chiefly referred to causes connected with irritations within the canal or with the urine itself. But spasms of these muscles may occur through excitement existing elsewhere, and not in the urinary or genital system at all.

Thus the presence of hæmorrhoids, especially when inflamed and causing tenesmus and excessive contractions of the sphincter ani, is sometimes a cause. So occasionally also are rectal fistulæ. Operations about the anus, particularly that for the ligature of hæmorrhoids, are frequently followed by retention of urine from sympathetic muscular contraction. That excessively distressing affection, fissure of the rectum, or irritable ulcer, is not less liable to occasion a similar difficulty. The connection and sympathy existing between the sphincter ani and the compressor urethræ have been before alluded to (pp. 19, 20), of which such cases become an additional illustration. A similar condition of things has been attributed to the presence of tape-worm in the intestines,[1] also from that of ascarides in the rectum, the intense itching which the latter occasion giving rise to it. The distressing prurigo about the anus, which affects elderly people more particularly, has been recognised as a cause in like manner.

It is not surprising that mental emotions should sometimes interfere with the functions of micturition, when we recollect how intimately united are the bladder, urethra, and their muscles, not only to the cerebro-spinal centres by a supply of spinal nerves, but also to all the other viscera, abdominal and pelvic, by the abundant interlacement of those organic nervous fibres, by which system and its numerous ganglia, influences are propagated and sympathies excited between each, so that one function can scarcely suffer to any extent without more or less implicating another: it may be, arising from some want of accurate consent or harmony in the series of acts which are necessary to produce most movements in the animal economy, however simple such may appear to the casual observer. Here and there a case certainly occurs which seems to admit of explanation only on such grounds.[2]

Very rarely indeed a narrowed condition of the urethra has been observed to occur at periodical intervals of twenty-four or forty-eight hours, and to yield, after the failure of other means, to the influence of quinine. One such case is recorded on the authority of Sir B. Brodie, in a paper which appeared in the 'Medical Gazette,' vol. i. p. 107. Precisely the same condition has once occurred in my own experience, and was similarly cured.

The distinguishing feature which marks the phenomena we have thus ascribed to irregular muscular contraction, and by which they are contrasted with those of organic stricture, is their transitory character. The symptoms of a narrowed urethra may repeatedly occur, but at times it is evident enough that the canal possesses its natural degree of patency. This is never the case in the presence of organic stricture; the stream then varies, but it never assumes the natural size.

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[1] An example of this kind is recorded in the *Medical Times* for April 26, 1848. It was originally reported by Mr. Tuffnell, in the *Dublin Medical Press*. That gentleman describes the patient as coming under his care with marked symptoms of irritable bladder and stricture of urethra. The latter was recognised as existing 'at the membranous portion of the urethra.' After rest and medical treatment, which appeared to be strongly indicated, the patient greatly improved, but on relinquishing attention to these, a complete relapse took place. At last, the presence of tape-worm being suspected, appropriate remedies were administered, and one of these animals, 'measuring thirty feet, was evacuated.' The following sentence then closes the report: 'All the former symptoms immediately subsided, the urine became clear and healthy, and the patient was soon restored to permanent health.'

[2] Sir A. Cooper, in his lectures, says: 'Even an irritated state of mind, or a mind deeply engaged in study, will occasionally influence the nervous system to such a degree as to produce spasmodic stricture of the urethra.'

It will be manifest now, in relation to the subject of treatment, that general principles must be kept in view, and applied according to the particular requirements of each case. Local treatment of the urethra itself is of secondary importance, often unnecessary, sometimes indeed prejudicial. The first and main thing, as in all spasmodic affections, is not to regard so much the sign of symptom itself as to investigate the cause, a correct appreciation of which is the only key to successful treatment. This must be carefully sought, not only in the urinary track, but in adjacent and allied organs, and in the condition of the system at large. Speaking in general terms, it will be found that attention directed to the condition of the animal powers, the improvement of the secretions, to the regulation of the regimen and habits of the patient, will conduce far more to the removal of the local symptoms than any measures apparently of more direct or special application. Abundant illustration of these remarks will be found in connection with the treatment of the organic form.

**2. Inflammatory Obstruction to Micturition.**—I have already stated that the term 'inflammatory stricture' would not be employed here. In what way then does inflammation obstruct the function of the urethra? I believe that inflammation of the urethra offers little or no difficulty to the act of micturition, unless the prostate gland is attacked. Thus in acute gonorrhœa, as long as the action is limited, as in the early stage, to the anterior part of the canal, although the act of making water is painful, no material contraction of the canal exists. But subsequently, retention of urine may occur after imprudence or bad treatment, or even under the most favourable circumstances in some patients, and catheterism may be necessary to relieve it. The obstruction, however, is not in the region of stricture properly so called, but close to the neck of the bladder. It is, in fact, produced by inflammatory swelling of the prostate: and this is the real pathological condition formerly designated 'inflammatory stricture.' For example, a young man has had gonorrhœa some two or three weeks previously; and finding himself much better, has indulged in some relaxation of the prescribed regimen. He has permitted himself, perhaps, a free use of stimulants, strong exercise, or emotional excitement. Suddenly the stream diminishes, difficulty in making water increases, and he suffers acutely from complete retention, with its accompanying fever and anxiety. Examination will soon demonstrate that this is due to acute prostatitis, and under this head, and not here, its further consideration is to be pursued. When treating hereafter of Retention of Urine, this condition will be again referred to, but the subject properly belongs to a study of diseases of the prostate.

Are we then warranted in regarding any one of the conditions thus referred to, as examples of 'spasmodic stricture'? Certainly not: the title is inadmissible. Acknowledging that a temporary narrowing of the urethra may occasionally occur, the term 'stricture' is an undesirable one by which to denote the phenomenon; as it is indeed to any form of narrowing which is not organic and permanent as essential conditions. The term 'spasmodic stricture' is nevertheless a term often employed by medical men, in a loose fashion, not necessarily with intention to define thereby any express pathological condition; but to denote to the patient a state of the canal in which the operator intimates that there is sufficient reason for his inability to pass the catheter on any given occasion. It offers an acceptable occasion for making a retreat; and often when continued action would be prejudicial to the patient; and whatever may be the validity of the excuse, it furnishes an expedient, thanks to which, the most prudent course can be taken without rendering him who follows it liable to the charge of want of ability, of tact, or of courage. I have elsewhere spoken of it as 'an exceedingly useful excuse for the failure of instruments . . . that it has a sort of foundation in fact, and may thus be often a better explanation for the patient than anything else, when the instrument does not pass.'[1]

Without denying, then, that such modes of narrowing may sometimes be perplexing to the young surgeon whose experience at present is small, I am quite sure that the more trained and dexterous his hand becomes the less frequently will he meet with 'spasmodic stricture of the urethra.'

## CHAPTER VI.

### THE DIAGNOSIS OF ORGANIC STRICTURE—INSTRUMENTS FOR EXAMINING AND DILATING IT—BOUGIES AND CATHETERS.

The symptoms of stricture, however well marked, are insufficient to demonstrate its presence. To do this we must examine the urethra itself, and ascertain whether obstruction exists; and, if so, at what part of the canal; what is the nature of the obstacle, as far as it can be learned by instrumental contact; whether it narrows the urethra greatly, so as to leave only a small aperture for the transit of the urine;

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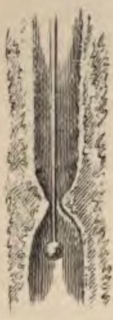
[1] *Clinical Lectures*, by the Author, 7th ed. p. 14.

or whether the narrowing, although notable, is but slight in degree; whether it consists of one contraction only or of several; whether it involves a small or a large portion of the canal.

In order to effect this object, a flexible bougie of medium size, that is, about No. 9 or 10 of the English scale, may be used, while as to form, it should be rather slightly curved, and blunt, not conical at the point. Whatever the patient may say, this rule is always to be adhered to. If a small instrument, which he of course instinctively prefers, be employed, it may pass through the stricture without giving any sign of its existence, and so fail to detect it; but if a No. 10 bougie passes easily into the bladder, we may be satisfied that no stricture, or at most a very slight contraction, exists. This bougie may be graduated in inches, for the purpose of noting at what distance from the external meatus obstruction is found. Holding lightly the penis in the left hand, the instrument being oiled, is gently introduced and carried on lightly until it stops; if it does so within five inches of the orifice, there can be little doubt of the presence of stricture; if at six inches or upwards, probably the natural obstruction often met with in the healthy urethra at the membranous portion, or nearer the neck of the bladder, is encountered. (*Vide* page 91.) In either case, the instrument is to be withdrawn, its point strongly curved, and it will perhaps reach the bladder at once. Supposing, however, that an unmistakable obstacle is found at any point within the distance of five or six inches, it may be concluded that stricture is the cause, and further examination is to be made. Having found and marked its situation, it is necessary next to know its calibre, which may be inferred from the size of the stream of urine, if it can be fairly seen, not always an easy matter at the first trial; still if the patient can pass water in the surgeon's presence, the size of the stream may guide us to some extent as to the degree of contraction. In general terms we may infer that the calibre of the narrowed passage is a little less than the volume of the stream, provided that there has been a fair quantity of urine in the bladder, so as to issue with some little force. A small flexible catheter, corresponding in size according to the principle named, may then be insinuated through the stricture, and onwards into the bladder, when a flow of urine will show that the instrument has followed the right track. In many cases, one stricture only is met with, and this usually at about four or five inches from the external meatus. In some instances we find it between two and three and a half inches, a situation which may be distinguished by the term 'penile;' and it may be associated with one in the situation previously described. Then it is not at all uncommon to find a narrowing within an inch or less of the external meatus, and thus complicating the bulbous stricture, or the penile stricture, or both, when the two are conjointly present. Whatever be the situation of any narrowed portion, after the first has been passed, the next may be ascertained by means of bulbous-ended instruments of suitable size, of which a complete set should be at hand. The stem of each is small, but the terminal bulbs should range from No. 2 or 3, English, up to No. 14; and metal is the material of which they should be made.

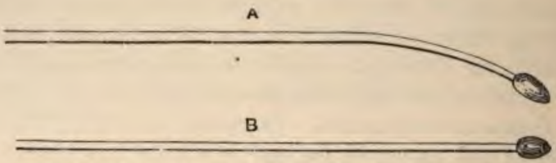
Different forms are preferred by different operators. Sir Charles Bell employed a small spherical ball on a slender stem, both in silver. (Fig. 11.)[1] I always employ a graduated metallic shaft, slightly curved at one end, with a flattened handle, and the bulb formed like an elongated acorn, or a sugar loaf. (See fig. 12, A and B, and fig. 13.) These give more certain indications than flexible instruments, when precise data are required; but it is by no means necessary to use them in all cases. When they are employed the object is of course to determine what sized bulb will pass with slight pressure through the narrow part of the urethra; and the observation is checked when withdrawing the instrument, which is again 'held' at that point in returning. The calibre and the situation are to be noted for future reference; and also the number of the strictures when more than one exists. With those patients who have but one narrowing, and that not very considerable, there is no special need to use bulbous instruments, and dilatation is effected without recourse to them. The use of bulbous-ended exploring instruments will be again considered when the subject of internal urethrotomy has to be discussed. (Chapter ix.)

FIG. 11.



Sir Chas. Bell's bulbous sound.

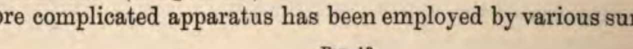
FIG. 12.



Straight and curved metal exploring bulbous instruments.

More complicated apparatus has been employed by various surgeons for measuring the calibres of the healthy and of the narrowed urethra. Some of these are interesting by reason of the ingenuity of their construction, or curious on account of the elaborate mechanism devoted

FIG. 13.



Another form.

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[1] *System of Operative Surgery*, by Charles Bell. London, 2nd ed. 1814, vol. i. p. 70 with a plate, which has been reproduced at fig. 11.

to the pursuit of facts which are so completely and easily attained by the simple methods described. Thus a urethrograph for delineating the diameter of the urethra at all its points has been proposed, which is not without a certain merit especially in design. To effect the purpose of the practical surgeon, however, nothing is so handy and certain as the ordinary bulb.

Still, I do not think that the proceeding thus explained is necessarily the best mode of dealing with a urethra when stricture is merely suspected to exist, and which the surgeon is called on to examine for the first time, although otherwise it is the natural and proper course to follow.

I prefer under the circumstances just described, as a less painful course for the patient, to select a supple tapering olivairy bougie about No. 17 or 18 of the French scale, and attempt to pass it on the supposition that the canal may be of normal size. If it be so, the instrument glides in and slips out without encountering the slightest resistance or grasp; and all that is necessary has been done, with the minimum of pain and trouble. If the bougie is stopped or 'held' anywhere, further research can be made with a large blunt-ended bougie or with a bulbous instrument. If the olivairy bougie failed to pass, then the research proper may be commenced. And inasmuch as in the majority of cases where diagnosis is demanded, no stricture exists, then these numerous cases are so handled as never to bring any trouble worth naming to the person examined, and no regret or discredit to him who examines. The question has been settled by the olivairy bougie, of which a larger number such as No. 21 or 23 may, however, be subsequently passed, if there is the slightest hesitation in the surgeon's mind as to the facility with which the bougie first employed made its transit. For in such conditions, the irritation producible by such a proceeding is almost absolutely *nil*.

Now, before entering upon the subject of the treatment of stricture, I shall discuss the question of instruments, their varieties, and the modes of passing them in the healthy urethra. A large experience has reversed my earliest views relative to some important points connected with this subject. For whereas, some thirty years ago, I was influenced by the prevailing tendency among British surgeons to prefer solid instruments to flexible; before long I acquired a decided preference for the soft and flexible instrument in every case in which it can be substituted for the other. In few words, the flexible instrument is capable of effecting all the good which can be achieved by the metallic instrument; and it does so with infinitely less of pain and irritation to the patient. The difference between the two, in most hands, often amounts to the difference between bleeding and not bleeding, pain and very slight discomfort, freedom from subsequent irritation and an attack of chill or fever; and as the sum of these differences, to a safe, easy, and rapid success in place of a painful and protracted one. In some cases I still prefer the silver instrument, in what circumstances will appear as we proceed. The leading varieties of. non-metallic flexible instruments are English gum-elastic catheters and bougies of various degrees of flexibility; the French soft, flexible catheter and bougie, and vulcanised rubber catheter. The wax bougie, formerly much used, is now superseded by the better appliances referred to. The leading varieties of the metallic instrument are the ordinary silver catheter; the steel sound or bougie (plated or not), either of uniform calibre or conical; and others made of mixed metal, which is slightly flexible.

1. The old English gum-elastic catheter. which may be made of all calibres, from an extremely small size upwards, is maintained in form by an iron wire or stylet, a matter of some importance, since curves may be modified with advantage for different cases; but it has also a valuable quality, not sufficiently appreciated, viz. of retaining any curve without the stylet, if the required form be communicated to the instrument while softened in hot water, when, if plunged into cold water, it issues stiff, somewhat elastic, and but very slightly flexible. The same, in a somewhat lesser degree, applies also to the gum-elastic bougie.

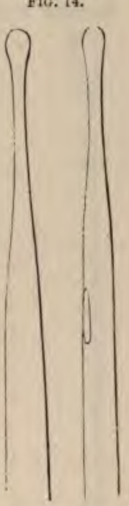
2. The silk web catheter, a recent improvement, is made in this country; its great flexibility and high polish render it in some cases very valuable, and occasionally superior to any other. No surgeon should be without a few of these, as well as of the preceding kind, in addition to some of the French flexible catheters described below, if he desires to have an effective stock in variety to meet any contingency which may arise.

There is another material also recently introduced, called 'celluloid,' made, in treating 'cellulose,' by a process which has been patented. The product is very horny and elastic in consistence, and consequently unfitted for either catheters or bougies. The two opposite qualities, of great flexibility and of perfect rigidity, are, each in their respective places, of high value in a urethral instrument; the former, when it is to find its own way by being insinuated; the latter, when the route of the instrument is to be exactly determined by a guiding hand. But a stiff and elastic instrument is always out of place in the urethra, being untrustworthy in either of the conditions described.

3. The French flexible catheter has much more flexibility than the old English gum, and much less elasticity. On the other hand, it is not susceptible of changes in form as the English instrument. Success in passing it depends indeed not on the guiding hand, but on its perfect flexibility. It is made in various forms, the two chief being known as *olivaire* and *coudée*. The former tapers towards the extremity; but

since the point so formed might enter a lacuna and impede progress, an olive-like bulb forms the terminal, and prevents that untoward occurrence, this bulb being usually two or three sizes less than the calibre of the stem of the instrument. (See fig. 14.) Both catheters and bougies are formed on the same principle; but it should be understood that this form is valuable only when the material is extremely flexible, as in that condition only does the terminal wind its own way through the closed track of the urethral canal. When the material is rather stiff and elastic, as ill-made instruments often are, then the olivairy form is not only useless, but it becomes a defect; the blunt non-conical form is always the best and safest to adopt for instruments of rather stiff and elastic structure.

FIG. 14.



French flexible bougie and catheter with bulbous ends of good form.

For the same reason, in selecting the ordinary olivairy instruments, every one should be rejected as useless or dangerous, if the end or stalk by which the terminal olive is attached is not quite flexible and tapering. If it is stiff, suggesting a temper like that of whalebone, and is not movable easily in every direction, springing back at once to the original form, instead of rather retaining any which is temporarily given to it, the instrument should be regarded as unsafe. The majority of olivairy instruments made in this country, notably the 'celluloid' above referred to, have this unfortunate quality of elasticity, the makers evidently understanding only the form required, which is excellent, but not the value of a 'doughy' (if the term is admissible) flexibility; nor the fact that the utility which the olivairy form imparts, ceases entirely when this mechanical quality is wanting. On the other hand, when the neck or stalk by which the terminal olive is connected with the stem of the instrument is too slender and soft, this part is liable to double back, if the slightest obstacle is encountered, instead of continuing onwards along the canal. A flexible and rather short neck or stalk, not too slender, should alone be accepted, when selecting these instruments.

The great importance of the subject affords the reason for the length, persistence, and precision of the statements made in this place, in order to define the distinctions pointed out in regard of the form and mechanical qualities of flexible instruments.

4. For silver instruments, in which the curve is necessarily nearly fixed, although good silver catheters will bear altering very well to some extent, a good form is desirable. For it is evident, that one curve may be too small; another too large; and that some mean must exist which is the most generally applicable for all purposes.

If it be necessary to construct a sound or catheter upon *à priori* principles, one would naturally adapt its curve to that of the least movable portion of the urethra itself. In the anatomical part of the work, this was shown to be equal to a portion of the circumferential line, equal to about three-tenths, of a circle three inches and a quarter in diameter. Hence the curve of an instrument designed to traverse the canal should naturally correspond thereto.

The principle of construction may be illustrated by the diagram fig. 15.

The curves of the instruments which are often found at the makers, describe, as nearly as possible, arcs of circles varying from four to four inches and a half in diameter, which arcs comprise rather less than one-fourth of the circumference. And sometimes, which is worse, the last inch of the sound is scarcely flexed at all, but forms a straight line at the end of the curve, as represented in fig. 16; a form which is unfitted to traverse the urethra with ease and safety.

FIG. 15.

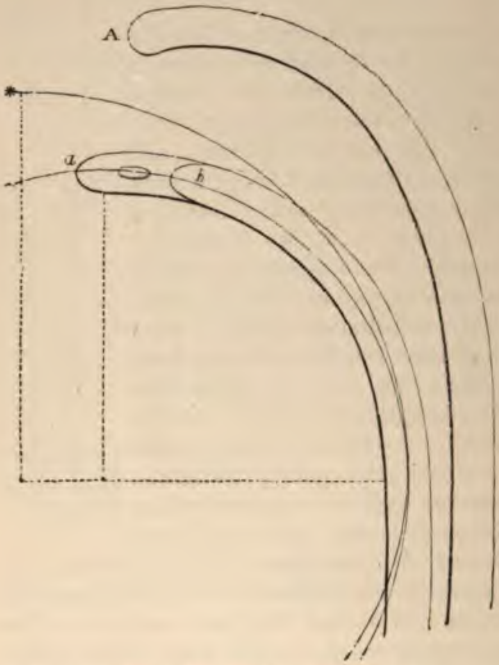
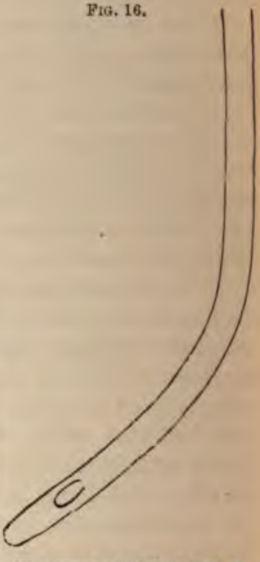


FIG. 16.

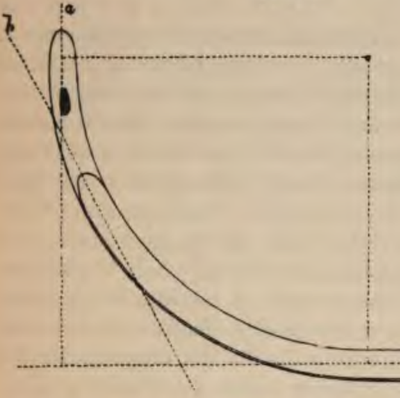


The most undesirable kind of curve to employ.

FIG. 15.—Curved line forming an arc of a circle, three inches and a quarter in diameter.
*a*, a catheter, and *b*, a sound applied to it.
* Curved line forming an arc of a circle four inches in diameter; a form commonly used, but undesirable.
A, from Sir Charles Bell: 'the proper curve given to the point of a bougie, in order to avoid the natural obstructions.'—*Morbid Anatomy of the Urethra*. This corresponds very closely to the curve here adopted, and practically is a most useful form.

The direction of the point of a solid instrument, in its relation to the direction of the shaft, is a matter of importance for the operator to be perfectly cognizant of. In the catheter described at figs. 17 and 18, the direction of the point is at right angles with the axis of the shaft. Consequently it is easy to maintain a constant view of its progress and bearings (in the mind's eye), however deeply buried the instrument may be, by remembering this relation. Thus, when the shaft is in the horizontal position, it is known that the point must assume the perpendicular.

FIG. 17.



*a.* An instrument (a catheter) in which the axis of the point forms an angle of 90°, or a right angle, with the axis of the shaft.
*b.* An instrument (a sound) in which the axis of the point forms an angle of 120° with the axis of the shaft, or a right angle and the third of a right angle.

All instruments should be so constructed as to exhibit a certain easily determined relationship between the axes of their shafts and points. The solid sound may vary as before described; the axis of its point, instead of forming a right angle with the shaft, may subtend one which is more obtuse. (See fig. 17, *b.*) So, again, in a catheter which requires to be more curved than that delineated, as in the catheter for enlarged prostate,

FIG. 18.

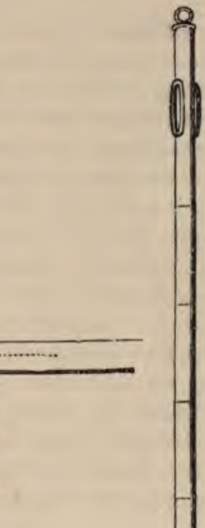


FIG. 19.

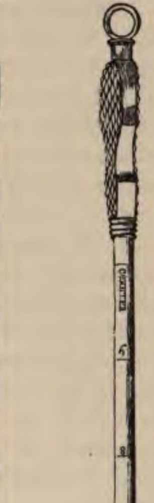


FIG. 18.—A catheter; curve formed on a circle three inches and a quarter diameter; direction of point at right angles with direction of shaft. On a scale of half the actual size.
FIG. 19.—A similar catheter, with a wooden handle instead of rings.

the same relationship may nevertheless still be advantageously maintained between the axes of the point and shaft, by curving backwards the latter just so many degrees as the point incurves, the direction of which is thus at once indicated by the line assumed by the handle.

Something remains to be said about the handle of an instrument. Solid sounds may have flat, expanded, handles of metal, wood, or ivory, as indicating exactly the lateral direction of the instrument, so that it cannot twist or turn in any degree, without the deviation being perfectly manifest. A ring on each side, provided it be oval and sufficiently large, answers the purpose equally well; it is, however, a matter entirely for individual taste or opinion. The formation of the eyes, or openings through which the urine passes, also involves a matter of some importance. If too large, they certainly help to obstruct the passage of a catheter, from the mucous membrane of the canal protruding into them, which affords a ground of preference for the solid sound, when withdrawal of the urine from the bladder is not indicated. A small opening on each side is sufficient, bearing a relative proportion in size to that of the catheter, but which might advantageously be a little smaller than those which are generally made: one should be placed at the distance of half an inch, the other at one inch, from the extremity, and the edges should be neatly and smoothly bevelled.

**Introduction of the Silver Catheter.**—It is desirable to follow a uniform plan; such a practice leads sooner to perfection in the art, than can be attained when indifference to method exists. First, as to the position of the patient. It is usual in most cases to place him with his back against the wall: the heels should be eight or ten inches apart, and about four or five inches from the wall, so that the nates rest lightly against it behind. An appropriate instrument having been selected, it should be warmed a little if the weather is cold, and oiled. In introducing it, the handle should be lightly held between the thumb and the fore and middle fingers of the right hand, the concavity of the curve looking towards the left groin of the patient, and the direction of the point being almost horizontal. The penis is now to be gently raised with the left hand, while the point of the instrument is inserted into the urethra and slowly carried onwards until four or five inches have disappeared, the handle being gradually brought to the middle line at the same time, and maintained close to the patient's abdomen until it has reached the perpendicular, when it is to be lightly depressed; and as the point is felt to traverse the sub-pubic curve, the handle is gradually brought down towards the operator, until it sinks beneath the horizontal line, when the opposite extremity will be free in the bladder. The more quietly, gently, and unostentatiously these manipulations are accomplished, the more credit will the operator obtain for the possession of a light and easy hand; a credit, let it be remarked, which is generally appreciated by the patient. Whatever obstruction is met with, no force is to be used at first. If any difficulty is encountered, the penis is gently drawn forwards on the instrument, and the direction of the latter varied. If difficulty occurs in the act of depressing the handle, just after this has reached the perpendicular, it very probably arises (supposing no organic constriction to exist) from making this alteration in its course too soon, and if the instrument be replaced in the perpendicular position and pushed onwards a little farther, before depression is made, very likely the difficulty will disappear. If a solid sound of good size be used, and the urethra be healthy, its own weight is almost sufficient to carry it through the canal; or at all events, a very slight pressure from the fore-finger upon its handle will be amply sufficient, if additional impetus be required. It is never to be forgotten that a lever of a very powerful kind is in action when depression of the handle is made, the extremity of which lever is in the operator's hand; the fulcrum at the convexity of the curve, the resistance being the structures upon which the point impinges, and these may be perforated if undue force is applied. Whatever the obstruction, it is never to be carried by storm. A patient, persevering, and unruffled spirit, with a light and dexterous hand, will eventually succeed in cases of difficult catheterism. All attempts at display, at brilliant manœuvring, at rapidity of execution, should be regarded as wholly out of place; fraught with danger to the patient, and if so, surely calculated to redound, at some time or another, to the discredit of the operator.

That mode of passing a catheter, which has obtained the term of the 'tour de maître,' is on these grounds objectionable. It consists in introducing the instrument with the convexity of its curve upwards, and with the handle in a perpendicular line beneath; in carrying it to the deep perineal fascia in this direction, and when it has arrived at that point, in sweeping it round so as rapidly and adroitly to describe a half circle, of which its point is the axis; at the same time gradually depressing the handle to carry the instrument through the sub-pubic curve. It is the same operation as that before described, but more rapidly performed, and commencing with a long sweep from below. It can only be necessary when the patient is extremely corpulent. In many cases we may prefer to place the patient in a recumbent position. Both operator and patient thus occupy positions of less constraint, a matter of importance if much time is to be expended. In some instances indeed it is almost necessary; for example, when the latter exhibits a tendency to faint, or when he is confined to bed. The head and shoulders should scarcely be elevated, and the knees a little raised and separated from each other. The operator should then stand on the left side of the couch or bed, hold the catheter as before directed, introducing it over the patient's left groin, the handle being in the horizontal direction; he should support the penis with the left hand, holding it lightly either between the thumb on one side, and fore and middle finger on the other, or the palm being upwards, so that the middle and ring fingers hold the penis just behind the corona glandis; the index finger and thumb are then at liberty to be applied for the purpose of retracting the prepuce if necessary. The beak of the instrument having been introduced, it should be remembered that during the first two inches, it is to be maintained against the inferior wall of the canal for the purpose of avoiding any hitching at the outset in a lacuna on the roof, sometimes considerably developed, an accident which gives the patient pain, has an awkward appearance, and sometimes disconcerts a young operator not a little. The fingers of the left hand gently draw the penis over the instrument as it glides easily on to the bulbous part, the handle still being horizontal, or nearly so, arrived at which, if some obstruction is felt, the instrument should be withdrawn an inch or so, and again passed, taking care not to elevate the handle so soon, after which, by gently raising it and causing it to describe a curve along the middle line, the extremity will probably glide slowly upwards into the bladder as the handle sinks towards the interval between the patient's thighs. It is especially in the latter third of the course that the point of the instrument should follow the upper aspect of the urethra, rather than the lower one, so as to avoid the natural obstacle due to the closeness of the canal at the junction of the bulbous with the membranous portion of the urethra, and lastly, that which sometimes exists at the internal meatus or neck of the bladder. If this manœuvre is not sufficient to insure success in passing the sub-pubic curve, the operator may make gentle pressure with the fingers of the left hand on the curved part of the instrument, as felt through the soft parts in the perineum, guiding it after he has withdrawn the point, and as he again applies it to the seat of the obstruction. He is now also conveniently situated for subsequently using the left forefinger in the rectum, or otherwise, as occasion may require, the catheter being still held in the right hand.

In exploring the urethra, especially if the symptoms are not such as to render the suspicion that a stricture is present more than probable, we are not hastily to conclude, because a little obstruction presents itself in the passage, that an organic constriction is of necessity the cause. The part is extremely sensitive, and resists any but gentle efforts to traverse it, the more so if it be the first time an instrument has been introduced. The involuntary fibres close upon it, as if to repel the intrusion, and the perineal muscles are prone to contract on the approach of the unwonted stimulus. Some persons always exhibit this involuntary resistance, even when they have become in a measure habituated to the use of a catheter. In such cases no violence may be used: any attempt to force a passage would only increase the difficulty.

Arrived at the neck of the bladder, we may here encounter an obstacle, and still no stricture be present; indeed it is not very uncommon to find the point of an instrument stopped just at the moment the operator thinks all difficulties surmounted. This is more likely to occur with a small instrument than a large one, and with one which is slightly than one which is strongly curved. Occasionally, this may be accounted for by a conformation very rarely, although sometimes observed in the bodies of those who have not suffered from disease in the urinary organs, and have not been treated for any, nor from enlargement of the prostate, the obstruction caused by which at this situation is familiar to all. The floor of the canal at the point described, of which it is difficult to say whether it most belongs to the urethra or to the bladder, is unduly elevated, the uvula vesicæ projecting into the internal meatus, or occasionally a band of mucous membrane appears a little prominent, stretched transversely across the opening. Either of these obstacles may be especially likely to entangle a sound which is not large enough to dilate the passage and ride over such an obstacle, or possesses a form so little curved as to travel too closely along its floor. (See fig. 20.)

FIG. 20.

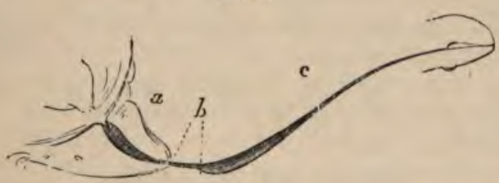


Diagram of urethra in natural condition, *a b* and *c* representing the prostatic, membranous, and spongy portion, respectively: showing the lacuna magna close to the external meatus, on the upper surface, and the natural obstacles at the entrance of the membranous portion and at the neck of the bladder, to be avoided by following the upper aspect of the canal rather than the lower one.

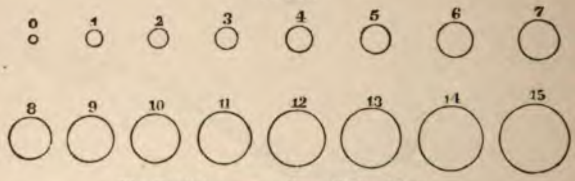
**Introduction of the English Gum-Elastic Catheter.**—In the healthy urethra the catheter is first removed from the stylet, and the curve observed to be sufficient: if not, it is increased, and the instrument plunged into cold water to maintain the curve. The object to be particularly attended to in introducing this instrument, is not to spoil or unbend the curve while traversing the anterior part of the urethra, but to preserve it for the posterior part where that form is required. Hence, supposing the patient upright, the penis is simply supported, not elevated, by the left hand, and the end of the catheter introduced, the shaft being perpendicular: as it continues along the first four or five inches of the urethra, the shaft is kept in that position, gradually approaching until it is quite close to the belly. Still maintaining it vertical, until the point has passed the sub-pubic curve, the shaft is now rather quickly depressed towards the operator and gently pushed in at the same time, until it sinks beneath the horizontal line and the urine flows.

Whether this instrument or the gum-elastic bougie is to be passed, success is almost invariably attained, and the instrument passed easily and painlessly, by keeping its point well turned up, so as to avoid contact with the natural obstacles just enumerated. The heat of the body has a tendency to increase the flexibility of the instrument, and thus to unbend the curve imparted to it; so that it is often desirable to remove it, re-form the curve, and stiffen in cold water, after using it unsuccessfully for two or three minutes.

The French flexible instrument with a bulbous extremity is simply pushed gently onwards, in a horizontal line if the patient stands, and it finds its own way, if it goes at all, smoothly and easily into the bladder.

There is one other point to be noticed in comparing English and French instruments, in which the latter have a decided advantage, viz. the respective gauges of their calibre. The former scale is from 1 to 12, and it can scarcely be said that it is constructed on a uniform system; the measurements being arbitrary, and differing slightly in the hands of different makers. (Fig. 21.) The French use the millimetre as the basis of their gauge, and the number of the scale gives the exact size of the instrument, and consequently of the stricture in millimetres. No. 1 being one millimetre in circumference, No. 2 two millimetres, and so on, the increase in size being uniform as well as very gradual. Again, instead of a range of No. 1 to 12, the French extends from No. 1 to 30 or even higher. (See fig. 22.) It begins lower and goes higher than the English range, and the steps are more gradual, which in practice is of great value in enabling the surgeon to dilate more easily for the patient. The No. 3 of the metrical scale is about equal to our No. 1, and the No. 21 to our 12. I have no hesitation in regarding this system as superior to our own, and in advising its adoption here; and as it is unquestionably superior, our employment of it must simply be a matter of time.[1]

FIG. 21.



The English gauge. From Weiss & Son.
It goes to No. 18; the sizes beyond No. 12 can be inferred.

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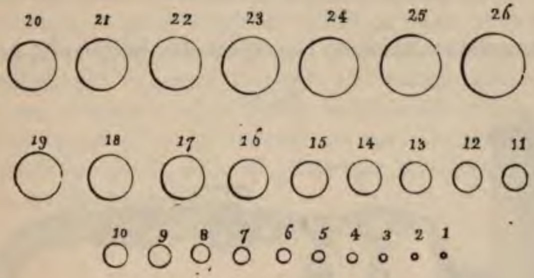
[1] Messrs. Weiss and Son, at my recommendation are now making all instruments on the millimetrical system.

Among other modes of examining stricture, the introduction of artificial light into the urethra, so as to render visible the orifice, as well as the condition of the canal adjacent, has been repeatedly employed. Attempts to utilise such observations for practical purposes have been made at remote periods in the history of surgery. During the present century, the subject has occupied surgeons in America, France, and in our own country. The most successful results obtained have been those of Avery of the Charing Cross Hospital, more than fifty years ago, followed by the improved endoscope of Desormeaux of Paris; since which a simpler form was devised by Mr. Warwick, in which sunlight or gaslight are available as well as the spirit-lamp. (Fig. 23.) Much more recently the elaborate apparatus made by Leitner of Vienna has been employed for both vesical and urethral explorations. After a long and careful study of these instruments, I am compelled to record my belief that they are of very little value. I have never yet found them of the slightest service in stricture. To the surgeon who has a delicate and practised hand, the endoscope can offer no advantages, and if he is not so endowed, it can be of no use at all, but rather a source of danger. For the proper employment of it requires tact and delicacy, as the application is a more irritating

FIG. 22.



The French gauge.

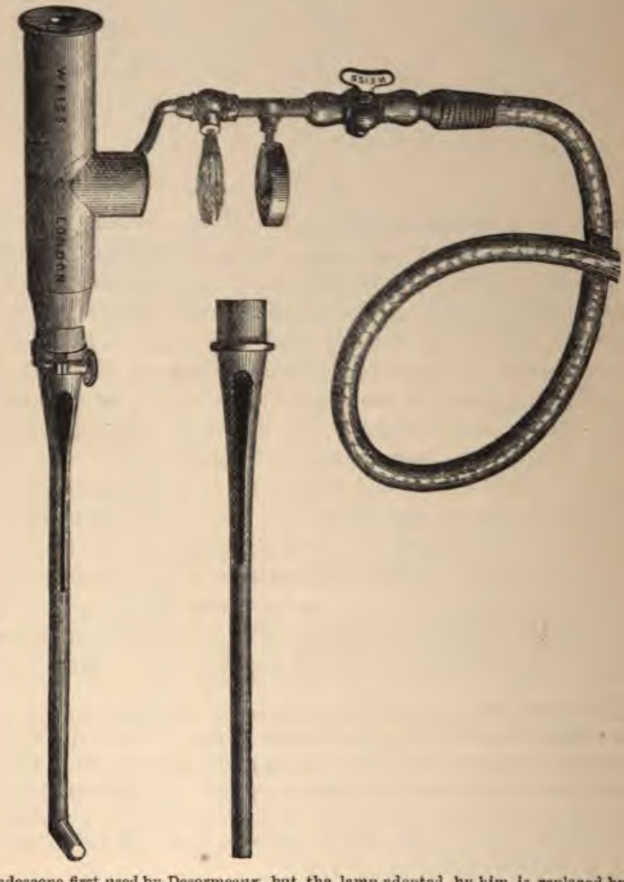
Taking the sizes employed by the chief London instrument makers as representing the 'English scale,' I have constructed a table, in which the sizes of the French (Charrière's) scale from 1 to 24 occupy the upper line, while the sizes of the 'English scale' occupy the under line; so placed that the relation of the two scales may be seen to each other. Note that the numbers do not generally coincide in situation—thus: the English 6 is between 11 and 12 of the French scale, but nearer to the 11 than to the 12, and so on.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Scale of Charrière . . . | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| English Scale . . . | 00 | 0 | 1 | | | 2 | | 3 |
| Scale of Charrière . . . | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| English Scale . . . | 4 | 5 | 6 | | 7 | | 8 | 9 |
| Scale of Charrière . . . | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| English Scale . . . | | 10 | 11 | | 12 | 13 | | 14 |

and tedious process than that of passing a sound or catheter in any ordinary case. And until he has become practised in its use, the indications derived from endoscopic examination are more likely to be misleading than the reverse. Better results even than a glimpse of the stricture affords, are to be obtained by well-adapted manipulation unaided by vision, as we shall learn hereafter when treating of that subject.

Relative to the materials to be employed in lubricating instruments to be passed into and through the urethra little need be said. Nothing, I think, diminishes friction more than olive oil. It may be thickened with a little washed lard in summer time, or at all times for con-

FIG. 23.



The endoscope first used by Desormeaux, but the lamp adopted by him is replaced by a gas jet and reflector (suggested by Mr. M. B. Hill). The same optical apparatus is employed with a powerful paraffine lamp inclosed in a mahogany case.

venience of transport in a box. Castor oil is sticky, so is glycerine, and both are less lubricant than olive oil; vaseline is very good. Mere soap and water answers exceedingly well, when the surgeon finds himself in a bedroom unprovided, and nothing better can be found within reach. With oils, about ten per cent. of carbolic acid should be mixed. All instruments should be kept scrupulously clean. Metal catheters should be frequently placed in boiling water with soda in it, and should be thoroughly cleansed thus. A weak solution of carbolic acid and water should be passed through all flexible catheters, immediately after use; by means of an elastic bottle or other form of power for the production of a forcible current through them. The plan of injecting the urethra itself with oil in certain circumstances will be considered in its place hereafter.

## CHAPTER VII.

### THE TREATMENT OF ORGANIC STRICTURE—DILATATION.

THE treatment of organic stricture mainly consists in the accomplishment of two objects, which may be thus briefly stated:

FIRST, to restore the natural calibre of the canal, or at least so far as shall be consistent with the safety and comfort of the patient.

SECONDLY, to maintain the adequate patency of the canal afterwards.

The removal of the tissue which implicates and surrounds a strictured urethra, and produces an obstruction to the outflow of urine, is not possible by any method yet discovered. Attempts have been made to excise this tissue, but only with the necessary result of insuring the subsequent formation of a cicatrix which constricts the canal more tightly than the original element did.

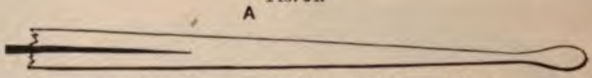
But stricture varies greatly in different cases; in extent. in degree, in intensity; in relation to the portion of the urethra affected, and to the number of narrowings in the same urethra. It differs also according to the individual; some constitutions largely sympathising with the local lesion, others showing little or no disturbance therefrom.

Hence various modes of treatment have been devised, and innumerable remedies have been tried during a long period of time, comprising some of the earliest experiences of surgical practice.

All these modes may be regarded as belonging to three classes. The opposing tissue of the stricture is either dilated, which was formerly said to involve the removal of some of its component elements by absorption, as the result of pressure ; or it is wholly or partially destroyed by chemical agents ; or it is split by an expanding force ; or it is divided by some cutting instrument applied within the urethra, or directed from the external surface inwards.

For the accomplishment of dilatation, solid cylindrical instruments are employed, as bougies made of wax, plaster, catgut, softened ivory, woven, cotton, or silk cylinders, covered with various gums and highly polished, india-rubber, some varieties of which have been already described ; others of whalebone ; lastly, of metal, which may be flexible or inflexible. White soft lead cores, or even fine shot, are used to form the centres of some of the flexible solid gum instruments. (Fig. 24.)

FIG. 24.



Flexible olivairy bougie, with movable lead stylet.

Then some are made of tubes, which slide closely over a central guide ; others dilate or expand after introduction ; others may be made in metal, or of elastic tube distensible by air or water.

Then, for the purpose of destroying the stricture chemically, both nitrate of silver and caustic potash are employed in various ways, hereafter to be described.

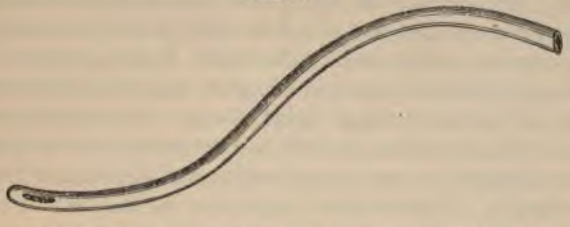
Lastly, there are numerous instruments for splitting or rupturing ; and also for cutting the stricture, such as 'urethrotomes,' in great variety ; and there are operations for exposing the stricture, usually from some part of the perineum, and dividing it from thence.

**The Treatment of Stricture by Dilatation.**

As this is the mildest, so it is the most desirable treatment to employ whenever the case admits of it. It is also the most generally applicable, as being that which is best adapted for a large proportion of all the cases presented to our notice in the early stage. It is the method which most surgeons agree to use as the rule, availing themselves of other means when its action is insufficient to maintain patency of the canal, from the unyielding nature of the obstruction, or impracticable from the acute sensibility of the urethra, and the consequent pain which results from and follows the operation. The records of surgery show also that it has been employed longer than any other mode of treatment, having been employed for the destruction of 'carnosities' in the time of Galen, and never having been laid aside since, although numberless additions to our means and appliances of cure have been subsequently both invented and forgotten.

It will be interesting, and not altogether an unprofitable task, to trace very briefly the various methods by which dilatation has been employed at different times in the cure of stricture. Catheters for evacuating the contents of the bladder were in use two thousand years ago ; some of these instruments, made of bronze or copper, were found among the remains of Herculaneum and Pompeii. (Fig. 25.) Celsus refers to them as made of the latter metal.[1] Three or four centuries later, silver was substituted, and has been employed for catheters ever since. Instruments of horn and leather were nevertheless occasionally manufactured. Among the Arabian surgeons, between the seventh and the twelfth centuries, silver catheters, both curved and straight, were employed.[2] At the end of this period we first hear of leaden sounds, which came into general use for the treatment of stricture about the fifteenth and sixteenth centuries. Bougies or slender wax candles were first used for the same purpose about the middle of the sixteenth century, by Aldereto, Amatus Lusitanus, Phillippus, and Andrea Laguna. These, however, were employed on account of some influence they were supposed to exert through certain drugs which either entered into their composition, or with which the bougies were anointed immediately before their introduction (Petronius, Parè). Wiseman, who flourished in the latter half of the seventeenth century, used 'the wax candles' unmedicated for the cure of 'caruncles' when recent. If obstinate or confirmed, he applied candles of appropriate size, previously scraped to a fine point, and dipped into a heated solution of medicated plaister, until it received a coating of that material. The

FIG. 25.



A bronze catheter now in the Museum at Naples ; from a sketch by the author. It is about 12 inches long, and the size is about No. 9 or 10 of the English scale. It is rather more slender than the engraver has made it, but the curve is correct.

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[1] Catheterism is described by Celsus as applied to the patient recumbent, the surgeon standing on the *right* side. Book VII. 26.

[2] Paulus Ægineta, in the seventh century, gives full directions for the performance of catheterism in cases of difficulty. Book VI. cap. 59. Venet. fol. 1528.

Rhazes, of Bagdad, in the tenth century, enters into greater detail respecting it.

Albucasis, in the twelfth century, recommended silver instruments (*Chirurgia*, ii. 59) ; but is supposed to have invented flexible metallic ones also, made, probably, of lead.

substances which he employed in this manner were powdered pomegranate, alum, oxide of lead, calamine, sulphate of copper, &c.[1] In other cases leaden probes were passed either down to, or into, the stricture, and retained for some hours in order to induce 'a wholesome suppuration.' Frequently the lead probe was reserved for maintaining the passage open after the use of caustics, but it was commonly rubbed with crude mercury before its introduction.[2] In the middle of the last century, Daran gained a large and lucrative practice by pretending to have discovered some chemical agent of extraordinary efficacy, which he applied by incorporating it with the materials of the bougie, the composition of which he kept a profound secret, attributing his success to this peculiarity. His manner of employing the bougie, which became generally known as 'the suppurative method,' consisted in passing one of these instruments into the urethra as far as possible, and in fastening it there, by means of adhesive plaister, for four, six, or eight hours; and this process he repeated until considerable suppuration had been set up, which action was assumed to be the effect of a resolution of the caruncle or cicatrix. Daran declared that such a result would not arise from the use of his bougie in the sound urethra, and that the discharge was strictly venereal and contagious in its quality, thus demonstrating the extraordinary power of the instrument to eradicate the disease![3] Mr. Sharp of Bartholomew's Hospital tested these pretensions, and showed that such effects of the bougie were, in the main at least, owing to mere pressure, and not to the assumed 'discriminating' power of Daran's composition. Nevertheless, he thought it as well to mix a small quantity of antimony or of some mercurial preparation in the instruments which he himself used, on the ground of the admitted anti-venereal action of the last-named metal.[4] Pure dilatation had, however, shortly before this time been attempted by some surgeons, by introducing through a canula into the contracted part of the urethra, tents composed of materials which would swell with the heat and moisture of the parts, a method which was soon relinquished from the accidents to which it gave rise.

Daran was followed by Goulard, who employed lead in the composition of his 'saturnine bougies,' the efficacy of which was for a time highly vaunted. The notoriety which the treatment by medicated bougies now obtained, chiefly through the pretensions set up on its behalf by Daran, was, as Hunter tells us, the means of leading surgeons to discover that 'any extraneous body of the same shape and consistence would do the same thing.'[1] And thus during the last half-century the bougie and metal sound have been almost universally employed to effect the cure of stricture, not through the agency of any medicinal substance introduced in or upon them, but by means of a certain degree of pressure upon the contracted portion of the urethra; a process to which, by common consent, has been applied the term dilatation. The rationale of this action will be considered hereafter.

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[1] *Wiseman's Chirurgical Treatises*, 4th ed. London, 1705. Book VIII. p. 531.

[2] *Cours d'Opérations de Chir.* par Dionis. Bruxelles, 1707. Pp. 188–9.

[3] *Observ. Chirurg. sur les Maladies de l'Urèthre*, by J. Daran. Paris, 1748.

Mr. Benjamin Bell tells us, however, that bougies had been so 'coarsely formed,' 'and their application so little understood,' before Daran's time, that although he 'attributed virtues to them which they did not possess,' yet 'we are in a great measure indebted to him for bringing them into general use.'—*A Treatise on Gonorrhœa, &c.* Edinburgh, 1793, vol. i. p. 270.

[4] *A Critical Inquiry into the present State of Surgery*, by S. Sharp, F.R.S. London, 1750, chap. iv.

In illustrating the treatment by dilatation, as it is pursued at the present day, a case will be supposed in which the diagnosis has been made, and a small instrument has been passed, with more or less of difficulty, through an obstruction situated in the bulbous portion of the urethra. The management of those at other points will be considered separately hereafter.

Unless such a case is more than usually obstinate the prognosis is favourable, and the method to be pursued is easy and simple.

First, as regards prognosis, for the patient will be almost certain to require an opinion respecting the prospect of success to be anticipated from the treatment proposed, together with the probable length of its duration; the answer will depend upon the following points:

If there be but one stricture, and that of not many years' standing, uncomplicated by any thickening of the soft parts, by abscess or fistula, which are wont to accompany old contractions; if it do not present that exceedingly tough and unyielding character, in denoting which it is common to apply the term 'cartilaginous;' and if the urethra be not unusually irritable and impatient of the presence of a sound, a favourable issue may be confidently predicted. If, on the other hand, the use of the bougie effects little progress, produces great pain, gives rise to fits of shivering, and attacks of retention, the ultimate effect of dilatation will probably be unsatisfactory, or if improvement does take place it will be temporary only. In such circumstances some more efficient treatment than dilatation must be resorted to.

**Treatment of a Simple Case.**—Usually a flexible bougie, as large as the stricture will fairly admit, should be passed, and at once be withdrawn. The instant removal is a point respecting which there is some difference of opinion among surgeons, and which will be referred to again when considering the rationale of the action of dilatation.[1] The instrument is to be withdrawn with as much care and gentleness as was employed in introducing it; a note of the size should be recorded, and the patient desired to come again in two or three days. The same bougie may then be passed, and will probably find its way with greater ease than before; if so, the next size larger is to be introduced, and a third, still larger, if there is room for it to pass easily. The intervals of the metrical scale being very small, enable the surgeon to accomplish this gradual dilatation without any difficulty. The visit should be repeated generally in three days, or it may be in two (but not sooner), if neither pain, nor bleeding, nor much smarting in micturition, follow and continue after the operation. Sometimes a fit of shivering occurs, or the patient may be faint or sick, which are not unfrequent effects of the passage of an instrument, more especially when experienced for the first time. If any of these phenomena take place and are repeated, let the interval be lengthened a day or two, and the general condition of the health be examined. If the stomach and bowels are loaded, an active aperient may be prescribed, after which some surgeons prescribe two or three grains of quinine, twice a day, to prevent a return of rigor. It is as well to advise the patient not to make water for at least an hour or two after his visit; nor should exercise of a violent character be taken during the treatment, as running, leaping, horse exercise, and the like.

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[1] *Hunter on the Venereal Disease*, 2nd ed. London, 1788, p. 117.

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[1] It has been, and I believe still is, the custom with some surgeons to leave the catheter or bougie for a few minutes, or even for half an hour, in the patient's urethra at each visit. Experience leads me to believe that no advantage follows this practice as a rule, while sometimes it occasions positive mischief. An excellent observer, who published a work on stricture, more than seventy years ago, containing much sound practical information, writes on this subject so pertinently, that I shall quote his language here:

'Our proceedings should be so cautiously conducted that a bougie, once passed, should be continued for no greater length of time in the urethra than the patient can easily bear; for it is the great fault of those who are engaged in the treatment of these affections that, when a bougie is once lodged in the urethra, they are of opinion that it cannot be too long retained; not considering that the introduction of a foreign stimulus too long continued, or too often repeated, must, in a certain degree, excite morbid as well as healthy actions; and if the former prevail, which will be the case should inflammation be produced, fresh coagulable lymph will be deposited, and a new organisation take place. Instead, then, of twenty minutes or half an hour (which is the usual time for each application of the bougie), I seldom continue it longer than a minute or two at each successive introduction. Having once passed a bougie, in this slow and cautious manner, through the stricture, I seldom consider this instrument any longer necessary.'—*Luxmoor on Stricture of the Urethra.* London, 1809, pp. 55–6.

If he complains of smarting or soreness of the urethra, and that micturition is painful, the state of his urine should be ascertained, as it is perhaps unduly acid, which will make it desirable to regulate his diet and habits so as to promote a healthy character in the secretions generally. At the same time, he may derive benefit from the alkalies, such as liq. potassæ, or citrate of potash, with or without the tincture of hyoscyamus, according to circumstances. Irritability of the urethra, however, is often allayed by the gentle and careful use of instruments. Even when much suffering is produced at the first attempt, it usually becomes notably less at every succeeding passage of the flexible bougie.

Supposing none of these consequences to happen, the same plan may be continued at each visit, that is to say, the same bougie which was employed at the preceding visit is first to be introduced, and then larger sizes should be carefully passed as before. In this way No. 11 to 13 English, or No. 20 to 23 French scale, may be easily reached in such a case as that described, when a very fair amount of dilatation has been achieved : if the last step or two in the progress have been readily made, without pain or annoyance to the patient, it is well to go on to one or two higher sizes. In this matter the operator's judgment alone can guide him. Generally speaking, any instrument which the external orifice of the urethra will admit, without appearing to be overstretched, may be safely employed. If it is unduly narrow, it should be divided freely.

An important duty remains. All strictures, as a rule, have a tendency to contract. Hence some have proposed to counteract the effect of this tendency by introducing an instrument to over-distend the canal chiefly at the contracted part. To effect this purpose peculiarly formed conical instruments, bellied bougies, 'bougies à ventre,' which are simply sounds whose diameter is greater by one or two lines at about two inches from the point than at any other part, have been employed. Practically, no advantage appears to arise from the use of this particular kind of treatment.

There are, however, no instruments better fitted to carry on dilatation when flexible bougies do not suffice than conical steel instruments, which are better when silver-plated. A set should be kept for the purpose, of which the following seven sizes afford a useful series for a small number.

The first, say No. 6 (English scale) at the point, gradually increasing to No. 8 at about two inches and a half from it, as represented in fig. 26.

The next, No. 7 at the point, and No. 9 at the largest part.

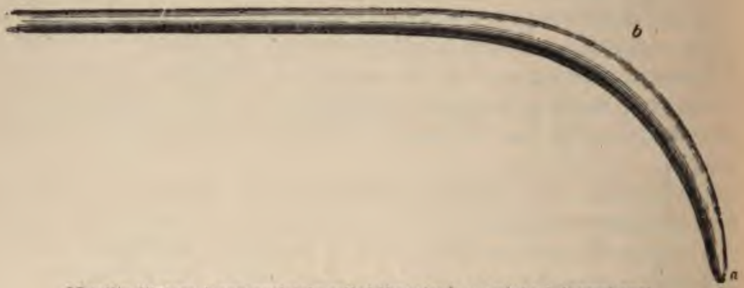
The next, No. 8 at the point, and No. 10 at the largest part.

The next, No. 9 at the point, and No. 11 at the largest part.

The next, No. 10 at the point, and No. 12 at the largest part.

The next, No. 11 at the point, and No. 13 at the largest part; and the next, No. 13 up to No. 15 or more.

FIG. 26.



Metallic dilators, inappropriately called 'bougies.' *a*, point; *b*, largest part.

These metallic dilators—which can scarcely be called 'bougies,' a term inappropriate for metal instruments, and which certainly, if retained at all now that the thing itself, the wax candle of our forefathers, is obsolete, should denote only flexible instruments—may be passed with great ease, owing to their polish and weight; while they can scarcely be surpassed for efficiency in the later stages of dilatation. For small sizes, that is below Nos. 6 or 7, it is not desirable to recommend their general use; as flexible olivairy bougies, or the same stiffened with lead, are in most circumstances safer.

In all cases, however, the maximum point of dilatation reached, whatever it may be, should be maintained for a short time, the largest sized instrument employed being used at gradually increasing intervals of time, in order to maintain the ground which has been won. Thus the treatment may be relaxed by degrees, making one or two weekly, one or two fortnightly, and, finally, one or two monthly trials of the instrument. The patient is prone to neglect this important part of his treatment. Enjoying exemption from all the symptoms of stricture, making 'as good a stream of water as ever he did in his life,' it appears perhaps unreasonable to require him to continue in attendance upon his surgeon. All that can be done is to explain the true nature of these affections to him, and he must abide the result of his own conduct. It will not then be our fault if he should reappear after a lapse of a few months and tell us that he fears the stricture is appearing again. In order to prevent this as far as possible, we should instruct him to pass an instrument for himself, when the urethra has been dilated. The faculty of thus maintaining the canal in fair condition is often of extreme value to him; and may be easily acquired.

**Cases of Difficulty and their Treatment.**—There are four chief causes of obstruction met with, which constitute difficulty in introducing an instrument into the bladder.

1. Extreme narrowness of the stricture.
2. The stricture may be tortuous.
3. It may be complicated with false passages.
4. The urethra behind the stricture may be irregularly dilated and reticulated.

Sources of difficulty of another kind, not mechanical, also exist, and are two in number, hereafter to be considered.

1. The stricture may be very resilient, and liable to become rapidly narrower after full dilatation, and even to produce absolute retention on any instrumental contact; and
2. Any use of the instrument may produce in the patient an attack of rigors.

Supposing that exploration has revealed the presence of a stricture, and that after the trial of several small instruments no penetration is effected. It is now essential, before making any further attempts with an instrument, to see the patient pass his urine, and that in as natural a manner as possible. In order to obtain a fair opportunity of observing, he should be ready to perform the act, and not be called on to repeat it after having just previously done so. If the stream is very small, the instrument to be next used must correspond with it, that is must certainly be a little smaller than the size of the stream itself. If the stream is not small the contraction cannot be considerable, and some fold of membrane, or perhaps a false passage, has entangled the point of the instrument. But supposing the urine to issue in a very slender jet, or only by drops, an English gum-elastic catheter of the very smallest size, and without a stylet, should be slowly and lightly introduced, and when not infrequently it may be insinuated into the bladder. But this does not happen in all cases; not indeed in the majority of instances if the stricture is very tight and close; still it is a plan always worth trying at first, because the small gum-elastic instrument can then be tied in without causing any irritation or even discomfort to the patient. Within the last year or two I have had smaller catheters made of this fabric than have ever been made before, and I have found them invaluable. The size is much less than No. 1 of the English scale, namely No. 1 of the French filière. They have a certain slight degree of stiffness not possessed by the very small French instruments, and this quality often enables the surgeon to insinuate them through a very narrow stricture, which the extreme flexibility of the very fine bougies referred to renders them incapable of penetrating. Messrs. Weiss have succeeded in making these delicate hollow instruments for me (see fig. 27), their useful quality consisting in the existence of a very small channel, literally one which a hair will almost fill, which procures the certitude that a drop of urine will in time show itself at the end of the instrument, if it has penetrated to the bladder. Of course the calibre does not suffice to relieve the organ of its contents; but the presence of the instrument, tied in to the urethra, in a few hours suffices to enlarge the passage sufficiently to enable the urine to pass outside the catheter.

FIG. 27.

FIG. 28.

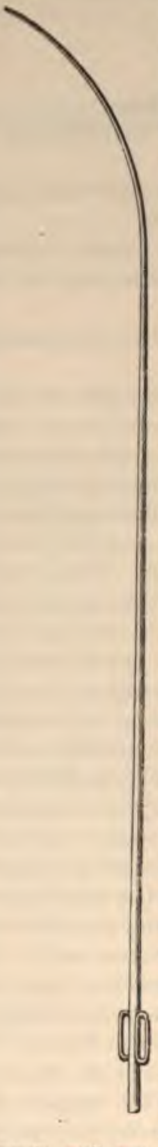


FIG. 27.—Extremely small gum catheter.

FIG. 28.—Silver catheter, fine at point, shaft increasing in size to afford stability.

No doubt the very fine and flexible bougies of black elastic gum have their value also occasionally, perhaps in their ability to follow a passage the line of which is a devious one. And they have been used, particularly by Maisonneuve, very gradually increasing in calibre from the very smallest size, so that as they are pushed inwards the stricture is a little dilated. And the plan can be carried further by screwing a second portion, also slightly larger, on the end of the first, and continuing to push inwards, so that the first coils up in the bladder as the larger portion finds its way through the stricture. In this way, in a difficult case, room may be made for the easier passage of a larger bougie at the next sitting.

But if all the flexible and elastic instruments fail, that which I have always found the most serviceable for a case of real difficulty depending on extreme contraction, is a very slender silver catheter, with shaft less slender and tolerably firm. Such a one is always to be used with the greatest possible care and lightness of hand, and is dangerous in the hands of any but an experienced and delicate operator. In introducing it, the operator should endeavour to avoid the floor of the urethra, as well as any lateral deviation in its course, the floor being a favourite situation for artificial passages; and the upper aspect of the urethra should be followed as far as possible, by which to slide the instrument in through the stricture. If success is wanting in this direction, he must try patiently, in succession, for a short time to insinuate the point either above, below, or on either side of the passage, if the slightest sensation of the instrument being 'held' suggests a probability that the orifice exists in any of these directions. And when the instrument is thus a little grasped, its progress is to be facilitated by patient, continued, and very moderate pressure. Some minutes may be devoted to the attempt, the success of which will much depend upon the steadiness and singleness of purpose with which it is pursued. A restless, changeable mode of operating, in which a different manipulation is constantly substituted for the preceding one, so that none consequently can receive a fair trial, is to be deprecated, as seldom tending to accomplish the desired object. Also, a clear apprehension of the anatomical relations of the part is ever to be present, so that the course of the canal with its adjuncts may appear correctly pictured and realized by the mind's eye, in spite of the structures which intervene. Too assiduously or too patiently we cannot study the anatomy of the pelvis and urinary organs, in order to attain that intimate knowledge of them the possession of which is necessary to a good operator, but at the same time will never make one. A light, delicate, and sensitive touch is the highest qualification for success in difficult catheterism; and it is in such circumstances that the acute perception of what the point of the instrument is encountering, and of the route it is taking, must be relied upon more than anatomical considerations, often invalidated by the effects of changes in the structures through disease. Frequently, the introduction of the left forefinger, previously oiled, into the rectum, will facilitate the passage of the instrument, either by permitting its point to be raised to some extent, or by enabling us to judge more precisely of its exact locality and relation to the parts around. Especially thus is determined whether or no the point of the catheter has entered a false passage, in which case the thin hard line of the instrument may be felt close to the finger, little else being felt intervening besides the mucous membrane of the bowel. In this condition the catheter must be withdrawn until the point is more completely covered, and then it is made to advance again in a direction more upwards than before. Whatever the result, should fifteen or twenty minutes have elapsed, and success be still wanting, further attempts may be postponed until another visit, as by this time the parts are probably irritated, and the difficulties may be augmented by too much manipulation. A much longer period than this, however, may be expended, and often with advantage, provided the operator has not caused pain or bleeding; provided, in short, that the search has been conducted in that careful and gentle manner which alone is conducive to success. The next attempt should not be made until a few days have elapsed, at all events until the soreness now occasioned has disappeared: and then, without preliminary exploration, the small instruments should be employed as before. If not successful at a second trial, others must still be made, and finally one of them will be so, if care has been taken not to inflict any severe injury upon the canal. None can appreciate the value to the patient of such treatment, confessedly the most difficult to practise, especially for a man of energetic or ardent temperament, laudably anxious to overcome difficulties, and speedily liberate his patient from the presence of impassable stricture. 'Festina lente' is a motto never for an instant to be forgotten; one moment's loss of self-command, and irreparable mischief may be done.

The employment of continued pressure on the face or commencement of an indurated and not very sensitive stricture, may be sometimes successful by its mechanical action upon the yielding materials of the obstruction. The operator, however, should be certain that he is really acting on the contraction, and not following or making a false passage. It is important to remember, as an invariable rule in relation to these attempts, that when the instrument is tightly grasped, the operator may infer that its point is safe within the strictured part, but that when the point feels free, movable, and capable of being withdrawn without appreciable effort, it is certainly not in the stricture; it may be, in such circumstances, in a false passage. If, after being grasped or 'held,' it advances suddenly for a short distance under pressure, and becomes movable, it is very probable that a false passage has been made, and the urethral walls perforated; after which, having withdrawn the instrument sufficiently, a careful attempt should follow to find the true course, and if this fails further efforts should be given up for a few days, and the instrument again used with vigilant care to avoid any reopening of the lacerated part.

It is often remarked by students that, although in the lecture-room *force* is invariably stated to be wholly inadmissible in the use of instruments in the urethra, yet at the bedside the surgeon himself may be occasionally seen to adopt it most undisguisedly, as if his theory and practice were at variance, or as if this were an 'ultima ratio,' a power in reserve, to be applied by no other hands than his own, and so a perplexing paradox has presented itself. It is impossible to explain by any words what is to be comprehended by the term 'force,' but if firm pressure is ever to be applied to the instrument this can only be done after the point has fully entered the stricture: no force is ever to be employed to make a way into it. Lastly, the more tight, narrow, and difficult is the stricture to be dealt with, the less pretext is there for force, or indeed for using pressure at all. The small silver instrument alone useful in such a case, has to be insinuated with the utmost gentleness. So fine a point as that which it possesses is easily pushed out of the canal altogether, after which the difficulty of succeeding is greatly increased.

If, after repeated attempts, a small catheter has not found its way into the stricture, or having entered it, has not been carried through it, other means must be tried. The grand object is to get fairly through a stricture, avoiding either the making or the following of false passages. To effect dilatation when the way is open, requires far less dexterity and patience. The first part of the operation is that on which all the skill of the operator must be brought to bear.

In such a case, then, we should endeavour to secure a good state of general health, and a normal condition of the secretions, by constitutional means hereafter to be referred to. A few days having elapsed since any preceding attempt, we may now avail ourselves of other aids in the endeavour to pass a catheter. Instead of permitting the patient, even if he is able, to leave his house for treatment, it is desirable to visit him when he is in bed, with a skin warm and moist from ample coverings. A hot hip-bath just before the visit is sometimes advantageous.

When introducing the instrument, there should be no chill; all unnecessary exposure should be therefore carefully guarded against. Premising that the precise situation of the stricture has been carefully verified beforehand, a silver catheter should be selected, the size of which should be a little less than that of the stream of urine. It is sometimes useful to apply oil to the urethra itself freely, rather than to the instrument. In order to effect this, the nozzle of a common glass syringe, containing from four to six drachms of pure olive oil, should be introduced into the urethra as far as it will go, the external meatus being at the same time closed upon the nozzle by the forefinger and thumb of the left hand, so that none can escape. Gentle pressure being now made on the piston-rod, the oil gradually finds its way down to the stricture; and if this be very narrow, the urethra in front of it slowly fills and becomes slightly distended; but as the piston continues to descend, the oil will gradually pass through the stricture, and onwards into the bladder, thoroughly lubricating every part of the canal. At the moment the oil passes through the stricture, the operator may sometimes distinctly perceive a slight but very complete sensation communicated to the hand, of resistance overcome, and partial collapse of the previously distended urethra in front. The syringe is then to be removed, the finger and thumb still commanding the meatus of the urethra, so that no oil escapes. The smallest catheter may now be introduced, and made to traverse the urethra—at all events, as far as to the stricture—without entangling its point in the walls of the passage; and when arrived at the stricture, the instrument, if adapted in size, will sometimes pass through it without much difficulty. The narrowed channel has not only been thoroughly lubricated but somewhat distended by the mechanical pressure of the column of oil which has passed through it; and this sometimes occurs to an extent which affords no inconsiderable amount of aid to the ing or greasing a small catheter, no one can doubt that all the lubricating material has been removed long before it reaches the usual situation of stricture, and that the natural mucus answers the same purpose in most cases.

To return to the question of size as regards the catheter to be employed. Repeating a rule which cannot be too strictly adhered to, that danger increases inversely with the size of the instrument employed, we yet may not overlook the fact that some of the worst and most obstinate forms of the disease have been proved after death to consist of a narrowing of the channel so extreme, that the smallest catheters ordinarily used are too large to pass through it. When such a case presents itself, I have been able to succeed by the employment of smaller instruments made specially for this purpose. For it is most desirable in these circumstances to pass, if possible, a hollow instrument; one that has the power of conveying the urine outwards, and so of assuring the operator that he has fairly and successfully freed the stricture, and has arrived at the bladder. Indeed, the smaller the instrument, the more desirable is it that this practical test of its safe position should be afforded. I have long felt how desirable—indeed, how almost necessary, it is to combine in one instrument the quality of tubular construction with minute size; the possibility of making it sufficiently small to be capable of entering the narrowest stricture; and, at the same time, so strong and steady in the hand as not to bend like flexible bougies, and thus deceive the operator.

This desideratum I endeavoured to supply by an instrument which may be called 'the probe-pointed catheter.' I designed it in the first instance, many years ago, for a case of great difficulty, in which the stricture was considered impermeable; and, practically speaking, had been so to all instrumental attempts both in London and in Paris for several years. Nevertheless, a few drops passed by the meatus, and I was convinced that if I possessed an instrument sufficiently small with sufficient solidity to enable me to guide it, it ought not to be impossible to insinuate it through the stricture. On my second trial with this instrument, I succeeded in passing the stricture. Small as it is, it was tightly held, but slowly and most carefully pushing it onwards for a short distance, on removing the stylet, the urine issued by drops. I firmly believe I should never have succeeded in overcoming that stricture had I not possessed this slender instrument.

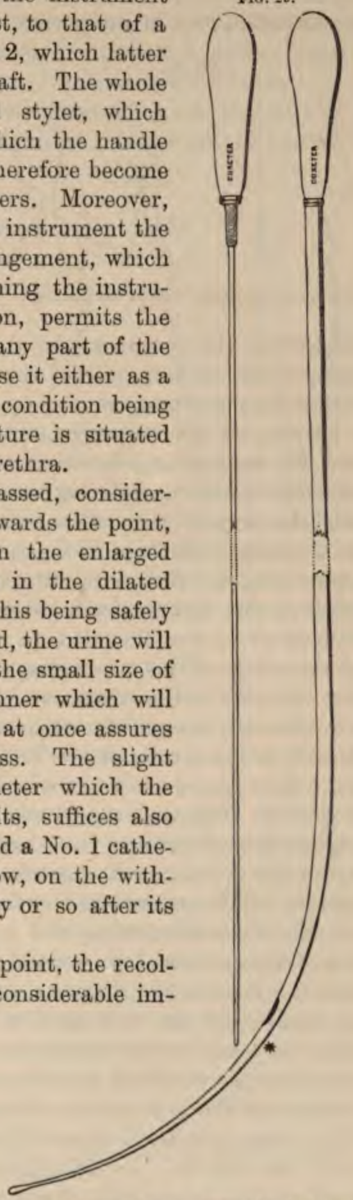
Its construction is as follows: The instrument resembles in form, length, and curve, the ordinary catheter, and is made of silver.

For the last two inches, however, it is perfectly solid, the extremity being in fact a fine metal probe. However small it may be necessary to use the instrument, so small can this probe-pointed extremity be made. The hollow part or channel commences at about two and a half inches from the point, and a small eye is placed on the inner aspect of the curve. At this part the instrument gradually increases in diameter; first, to that of a No. 1, and then to nearly that of No. 2, which latter it continues throughout the whole shaft. The whole is strengthened by a small steel stylet, which accurately fills the interior, and to which the handle is affixed. The small eye cannot therefore become blocked up with mucus or other matters. Moreover, the stylet screws in, and gives to the instrument the most perfect solidity. A simple arrangement, which can be understood better by examining the instrument than by any verbal description, permits the handle to slide, and be affixed to any part of the shaft, and enables the operator to use it either as a short or a long probe: the former condition being extremely convenient when a stricture is situated near to the external meatus of the urethra.

When the stricture has been passed, considerable care is necessary in guiding onwards the point, to prevent its becoming engaged in the enlarged lacunæ which are commonly found in the dilated urethra behind an old stricture. This being safely accomplished, and the stylet removed, the urine will issue, by drops only, on account of the small size of the eye, but nevertheless in a manner which will soon relieve the patient, and which at once assures the surgeon of his complete success. The slight but very gradual increase in diameter which the lower end of the instrument exhibits, suffices also to dilate the stricture somewhat; and a No. 1 catheter may generally be made to follow, on the withdrawal of the first instrument, a day or so after its introduction.

**Tortuous Stricture.**—There is a point, the recollection of which is sometimes of considerable importance, in applying this or any other solid instrument of small size to a narrow stricture. It is the fact, before referred to, that the orifice of the stricture very frequently does not lie in the direct axis of the urethra: in other words, it may be situated either to the right or left side, either above or below the normal

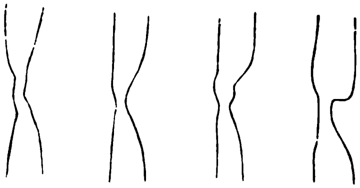
FIG. 29.



The right-hand figure shows the instrument complete. The asterisk placed just below its eye denotes the point at which the instrument becomes solid, continuing so to its extremity. The left-hand figure is the steel stylet, unscrewed and removed from the instrument.

line of the canal. (See fig. 30.) This character is sometimes so marked that attention to it in any particular case may insure the easy passage of an instrument afterwards; while forgetfulness of it may render success extremely difficult. In endeavouring to find the orifice of the stricture, simple pressure at the seat of the obstruction with the point of an instrument is not only useless, but injurious, unless the point has entered, and is grasped by the walls of the narrow passage. But by withdrawing the instrument for an inch or so, and carefully sliding it closely *along one side only* of the canal two or three times, then repeating the manœuvre on the opposite side; if this be unsuccessful, by keeping the point closely to the roof of the canal, or, on the other hand, by maintaining it constantly upon the floor, and thus, in a methodical manner, exploring consecutively each aspect of the urethral walls, the surgeon may often succeed in introducing the instrument into a stricture which could be entered by no other means, or, if so, only by chance. And a recollection of the aspect which proved successful on one occasion, will generally enable him to introduce the instrument at a succeeding attempt with very little trouble. I have verified the utility of this proceeding so frequently as always to pay particular attention to the existence of deviation, which appears to me to be more generally present than otherwise, although its extent varies considerably, being greater or less in different cases. In the same manner, also, a false passage is to be avoided when its presence and situation are verified. The same record has been of equal use to other operators to whom the patient may have been subsequently transferred. Thus, for example, a statement respecting any particular case that the obstruction will be encountered by the catheter at five and a half inches from the external meatus, and is most easily passed by letting the point of the catheter bear gently along the right side of the passage before it arrives at the distance named, may enable the surgeon, who sees the case for the first time, to introduce the instrument into the bladder as easily as his predecessor, who, after several observations, has verified the condition so indicated. Benjamin Bell, of Edinburgh, in the end of the last century recognised this fact, writing as follows: 'When there is cause to suspect that the passage is thrown over to one side of the urethra . . . the extremity of the bougie should be slightly curved, or bent before being inserted, and the point of it turned to that side where the passage is understood to be.'[1] (See fig. 35, p. 115.) A recognition of the same fact when meeting with difficulty in cases of

FIG. 30.



Diagrams of stricture, more or less tortuous.

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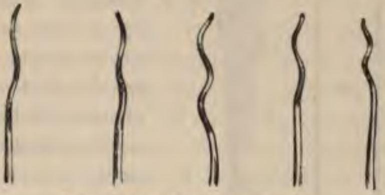
[1] *A Treatise on Gonorrhœa &c.* by B. Bell. Edinburgh, 1793. Vol. i. pp. 294–6.

obstinate stricture, led Sir B. Brodie to recommend an instrument whose point is made to deviate from the axis of the adjacent part, as figured in his well-known work. Leroy D'Etiolles, however, appears to have used, largely and systematically, some exceedingly small gum-elastic bougies, possessing points twisted somewhat into the form of a corkscrew.[1] (Fig. 31.) He recommends that these should be turned in every direction, until the point was guided through the devious passage, and he claimed to have achieved a considerable success from their application, a result which appears to be natural. Success may sometimes be attained by this mode of proceeding, as a matter of mere chance; still, in the hands of the experienced operator these long and slender filaments, as when made of whalebone for example and not of mere gum-elastic material, so as to permit of an intelligent guiding of the instrument, they may be rendered valuable agents by skilful manipulation. In the treatment of difficult cases some degree of solidity in the instrument is particularly valuable, when deviation of the orifice of a stricture from the access of the urethra has to be encountered.

FIG. 31.



Leroy D'Etiolles' twisted bougies.

Another systematic mode of dealing with very difficult strictures, narrow or tortuous, has been proposed and practised by Dr. Gouley of New York, and may be advantageously employed among other means. He passes slender filiform probe-pointed shafts, firm and unyielding, being made of whalebone, of considerable length, and of great tenuity, even down to the size of a bristle. (Fig. 32.) The points will take a permanent bend or twist by dipping them into boiling oil, giving them the form desired, and immediately plunging them into cold water. The urethra should be previously lubricated by a syringe full of oil, and a careful and prolonged search made. When the instrument is felt by its mobility to be safely lodged in the bladder, Dr. Gouley passes upon it his 'tunnelled sound,' that is to say, a slender steel director, gently curved and tapering (fig. 33) with a perforation at the vesical end, an eighth of an inch long, and a groove continued above it, for about two-thirds the length of the instrument. These directors may be of different sizes, the smallest being one millimetre and a half at the point.[2]

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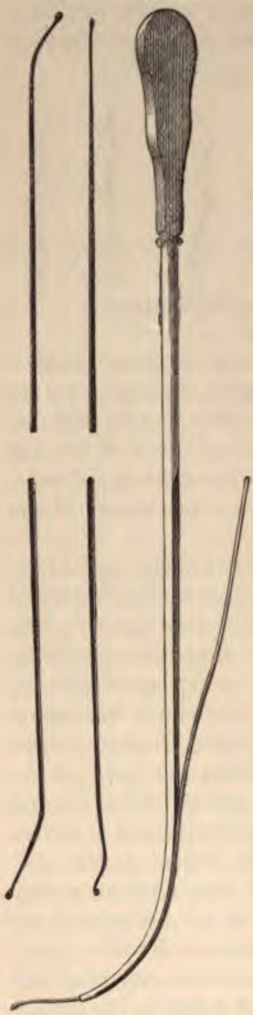
[1] *Sur les Avantages des Bougies tortillées et crochues dans les Rétrécissements*, &c. &c. par le Dr. Leroy D'Etiolles. Paris, 1852.

Also, a Second Report to the Academy of Medicine, at its sitting of April 18, 1854.

[2] *Diseases of the Urinary Organs*, by Dr. J. W. S. Gouley. New York, 1873, p. 53. The cuts are copied from this work.

**False Passages.**—The existence of false passages has been alluded to. They form undoubtedly one of the most perplexing complications which the operator can have to deal with, inasmuch as the difficulty of getting into the right opening is greatly increased by the readiness with whicht he instrument enters the wrong one.[1]

Fig. 32. Fig. 33.



When any patient has a false passage, a catheter introduced may pass with facility up to its very orifice and yet give issue to no urine. Hence has arisen the false notion that stricture may exist at the neck of the bladder. When the instrument has thus passed, a finger placed in the rectum easily determines whether or no there is a false passage; for if there be one, the coats of the bowel, which are very thin, alone intervene between the finger and the instrument, so that it is felt very distinctly; and generally occupies not exactly the middle line, but passes rather to the right or to the left. But if the instrument is in the right passage, the whole thickness of the prostate, not always very considerable, is perceived between it and the finger, always sufficient to show when the instrument is in the right situation. Supposing the instrument is felt in a false passage, it is to be withdrawn two or three inches, and then to be passed inwards again, keeping it as close along the upper part of the urethra as possible, ascertaining by means of the finger in the bowel that the instrument is not entering the old false route. It will be very likely to do so, because it is much more easy to pass into a false passage than into the right one.

**Difficulties beyond the Stricture.**—It is also important to bear in mind, while dealing with an old and tight stricture under all circumstances, that when a small instrument has been passed with some difficulty, great care is necessary in carrying the point through that part of the canal which is behind, on account of the irregular character of the urethral walls, which is common in such cases. I formerly exhibited at the Pathological

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[1] See notes of numerous preparations in the Appendix.

Society several specimens illustrating the condition referred to.[1] A considerable amount of dilatation of the urethra often exists posterior to an old organic constriction, and frequently, also, a fasciculated condition of the prostatic urethral walls: numerous intersecting fibrous bands appear prominent beneath the mucous lining, and interstices of corresponding depth and magnitude between them. (See figs. 5 and 6, page 38.) Sometimes the open sac of an abscess in the prostate, or existing anterior to it, forms a diverticulum, which it is by no means easy to avoid. It is easy to see that the difficulty of the case is by no means surmounted when the point of the instrument has been insinuated through the narrow stricture. We are not to push on at once, as if all difficulty had ended, for greater danger sometimes exists here than had been before encountered. Further, the delicate appreciation of an obstacle is much less easy after the catheter has passed the stricture, from the grasp which this exerts upon it.

Whatever the difficulty may have been, let it be supposed that at length a very fine instrument has been passed into the bladder. Under these circumstances it ought not to be withdrawn. After so much labour, the success gained must be insured by fastening the instrument securely in its place. It is most desirable to do so, even although it is a metal instrument; and it may remain forty-eight or seventy-two hours before being removed. Even then it may still remain if the patient is tolerably comfortable. It is prudent to keep the original catheter in the bladder at least three days, and then it will be easy to pass a small gum-elastic instrument. After all, it may happen at such a crisis, even to a surgeon of experience, that although he has once introduced a small instrument, either catheter or bougie, he is, after withdrawing it, unable to put it in again, or to replace it by another. There are some instances in which such a difficulty becomes the source of serious delay and anxiety. Under these circumstances a little apparatus made on the following plan has been long found extremely useful. (See fig. 34.) A very fine flexible bougie or catheter with a small socket for a screw at one end (A)—to which a stiff rod of similar calibre, and about twelve inches long (B), can be attached—is employed, and when the small instrument has once been passed, the rod is screwed on, and over it a small gum-elastic tube (C) may be slipped into the bladder, and fastened there, when the rod and small instrument are withdrawn. On the next occasion of changing the instrument, the rod and small instrument attached are first passed into the bladder through the tube, which is then withdrawn and replaced by a larger one slipped over the rod which secures the route as before, and is itself again withdrawn.

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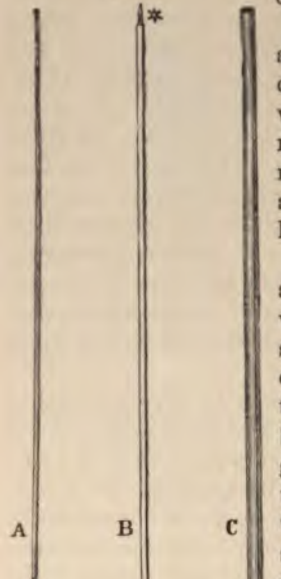
[1] Vide vol. vi. of *Transactions of the Pathological Society of London*, pp. 245, 246, 263. Vol. v. of ditto, pp. 208–10.

From this point it will be easy to proceed by 'continuous' dilatation, hereafter to be described, increasing the size of the gum catheter from time to time.

FIG. 34.

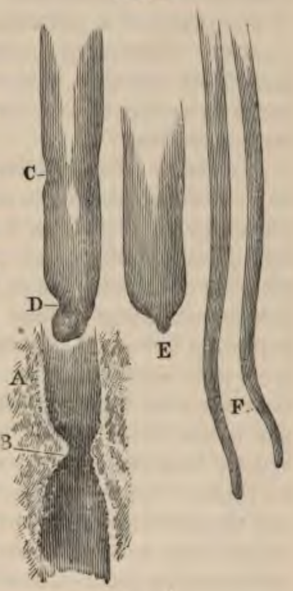


Oversliding catheters.

Certain modes have been adopted for ascertaining the physical relations of the orifice in very narrow strictures, with the view of obtaining some guidance as to the method of introducing a catheter: I shall notice two, the passing of 'model bougies,' and the employment of the urethral speculum.

Formerly, much was said and written about the use of 'model bougies;' contrivances for receiving and exhibiting an impression from the face of a stricture, and so indicating to the operator the direction which the true as well as the false passages take. Some slight advantage may perhaps be gained, but not much, by the application of these instruments: a brief notice of them therefore must be taken here. There are several methods of 'modelling' a stricture, and various materials have been used for the purpose. One of the best is said to be a wax bougie made in the usual way, but of rather softer material than it is customary to employ; such have been recommended by authors at different periods during three centuries past. A favourite but old-fashioned one contains equal parts of bees' wax, diachylon, and shoemakers' wax, of which the extremity may be softened by applying to it a moderate heat. Sir Charles Bell adopted what he termed 'the soft white bougie,' systematically for the purpose of estimating the extent and position of a stricture. Fig. 35 accurately represents the engraving taken from Bell's own drawing made by him for his work. The following is his explanation, with the letters of reference belonging thereto. 'The soft bougie is used to take an impression of the stricture, in order in some measure to ascertain its degree and extent. The bougie is oiled and heated so as to take the due curve adapted to the urethra; just before using it the point is dipt into warm water to soften it. It is then to be introduced and carried down to the obstruction, and allowed to remain there; it is pressed with a very steady hand into the stricture, where being allowed to remain a little time, it takes the impression of the stricture. Upon withdrawing it, we have a cast of the stricture; and we are now enabled to pass a bougie curved upon the model of the soft bougie. It teaches us also to apply the caustic with effect.

FIG. 35.



'In this plate I have represented the plan of a stricture; let A B represent the urethra, C D the bougie. Suppose that the soft bougie is pressed into the stricture, then the greater projection of one side of the stricture B has a corresponding indentation in the bougie D, and by withdrawing the bougie without twisting it at all, we learn where the caustic is to be applied, or how the point of the bougie is to be bent in order that it may pass.'[1]

Some years later Dr. James Arnott described his method of using a bougie of white wax, which he carried down to the seat of stricture in a silver canula, so as to protect the extremity of the bougie from injury during extraction.[2] Ducamp recommended that a gum-elastic sound should be pointed with a piece of modelling wax, and employed in the same way; but there is reason to believe that he availed himself of this as well as of other of Dr. Arnott's proposals in connection with the treatment of stricture, without acknowledging the source from whence the ideas were derived. Gutta-percha was formerly recommended by Professor Bigelow as the most useful material. He used a cylinder of this substance about the size of Nos. 9 or 10, softened at its extremity, for one-third of an inch, by being held over the flame of a spirit lamp; it is then carried down to the stricture, and maintained steadily against its face for about two minutes.[3] The employment of gutta-percha in the urethra requires the greatest care, for when a bougie made of this material has remained in the warm urethra one or two minutes, it becomes so pliable, that if there be a small contraction of the canal anterior to the stricture, the cast of which is required, a condition by no means uncommon, it is liable to elongate considerably in the act of withdrawal, and unless great care be taken, a portion may be left in the urethra. Indeed, the accident has not unfrequently occurred. It is remarkable how readily this substance is acted upon in this manner. I have never seen a wax bougie indented by the grasp of a stricture so deeply as one of the instruments in question. The material usually sold as gutta-percha appears to possess insufficient cohesive power to prevent its liability to give way and cause an accident; and no instrument made of it should ever be used for the urethra.

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[1] *A System of Operative Surgery*, by Charles Bell. London, 1807, vol. i. p. 102.

[2] *A Treatise on Stricture of the Urethra*, by Dr. James Arnott. London, 1819, pp. 76–7.

[3] Dr. H. I. Bigelow, Professor of Surgery in Harvard University. *Boston Medical and Surgical Journal*, Feb. 7, 1849.

The term 'Vital Dilatation' was formerly applied by Dupuytren to a mode of dealing with obstinate stricture, which he thought proper to employ when he failed to pass an instrument. It was simply leaving the point of a gum or metal bougie in close contact with the obstruction, so as to insure, if possible, that a degree of pressure is maintained against the obstruction for a few hours. For this purpose it is best, if the obstruction be situated far back, to employ a short gum-elastic catheter, say about No. 1, from which the stylet has been removed, in order that it may be retained in the bladder for a few hours, when it has penetrated so far. This plan is available equally for those cases in which no penetration has been made, and for those in which, although some degree of it has been accomplished, still the stricture cannot be passed; but, of course, it is inapplicable where false passage exists, as any sojourn of the instrument there could only be productive of serious injury. It has sometimes proved successful, where a good operator has failed by ordinary manipulation. Thus Velpeau, in his 'Operative Surgery,' writes: 'This method, which was pursued by Dupuytren, afforded him success in numerous cases, in some of which it certainly could not have been hoped for.' The principle of its action Dupuytren believed not to be mechanical, and explained it by stating that contractions of the urethral canal, which often resist active efforts, are known to give way to passive pressure, long continued, and that it is usual to observe an abundant discharge of mucosity, poured out from the part, as a primary result, after the occurrence of which the sound is enabled to enter. On these grounds, therefore, he designated this process, 'Vital Dilatation.'[1] In this way a considerable advance may, it is said, be sometimes made in a short time. It should be added that, in the adoption of this method, although the stricture may not have been passed, the removal of the instrument is occasionally followed by a fuller stream of urine than it is the patient's usual habit to make. After all, it must now be regarded as a method unworthy of an operator with a delicate hand and a wholesome belief in the efficacy of patient, skilful, manipulation; and has been abandoned by myself for many years.

[1] *Leçons Orales.* Paris, 1833, tom. iii. pp. 141–168.

**Continuous or Permanent Dilatation.**—Among the various means, not of carrying an instrument through an obstinate stricture, but of dilating it, when that necessary preliminary has been accomplished, one of the safest, and at the same time most expeditious, is that of retaining the catheter in the urethra for forty-eight or seventy-two hours at a time, without removing it. Especially when great difficulty has been encountered in its introduction, and there is reason to believe that equal difficulty would be found in replacing it, were it withdrawn, it is a safe and prudent proceeding to tie in the instrument and keep it there for a time. So if the difficulty arise from false passages; or if ordinary dilatation produces little result; or if, owing to extreme sensibility of the canal, each introduction of an instrument be attended with much pain and distress to the patient, and keeps the passage in a state of great irritation, or if it be almost invariably followed by a fit of shivering (repetitions of which are extremely debilitating), this treatment is, perhaps, one of the best that can be adopted. In putting it into execution, a week or two of confinement within-doors must be reckoned upon by the patient.

At the outset it will be almost unnecessary to say, that a catheter, and not a bougie, must be selected for the operation, because with narrow stricture, complicated possibly with a false passage, the safe position of the instrument is denoted by the appearance of urine passing through it; otherwise fine bougies will answer the purpose, provided care is taken not to fill the urethra, and leave room for the urine to pass around the instrument. Having succeeded in carrying it into the bladder, the next step is to fasten it there. For the purpose of doing this effectually with a metal instrument, carry a single turn of a broad calico bandage round the waist and fasten it in front; then at a point corresponding, or nearly so, with the crest of the ilium, make in the bandage a small opening, and pass through it about a yard or more of narrower bandage, carrying one end of it along the groin under the thigh, and up behind the buttock to the same opening to meet the opposite end, to which it is to be tied. Repeat the same process on the other side. Next pass a piece of narrow tape through each ring of the catheter and tie them on either side to the narrow bandage which lies on the adjacent groin. A little peg of wood or bone must be neatly fitted to the orifice of the catheter, for the purpose of preventing the constant escape of urine; or, better still, a piece of india-rubber tubing may be attached to the end of the catheter. This instrument should not be permitted to project into the bladder, as its point may then injure materially the coats, and produce inflammation, or, at least, much distress. It is borne much better, and for a longer period, when the point just reaches the neck of the bladder, and requires to be pressed in for half an inch whenever the patient desires to pass water. Catheters which are not quite so long as those usually employed answer the purpose rather better, since the instrument lies more securely and more easily to the patient, when a short portion only projects from the external meatus.

The patient lies on his back, with the shoulders a little elevated, the knees raised and inclining outwards. It will add materially to his comfort if they are supported by pillows, and if the feet also have something to rest against. Over the centre of the body the semicircular frame ordinarily used must be placed, to sustain the bed-coverings and protect the parts from pressure. The length of time the instrument is permitted to remain, will depend much upon the ability of the patient to retain it. Occasionally, patients suffer a good deal of pain from its presence, in which case, however, drawing out the catheter a little diminishes it greatly. But, if necessary, we should alleviate it by giving morphia in some form, also by freely administering diluents, as barley-water, with or without potash, as the case may require.

Sometimes an attack of orchitis results, as occasionally although very rarely happens also after the mere passage of a sound, or its retention for a few minutes only. The cause must be first removed, and the affection combated in the usual way. An attack of rigors may supervene within an hour from the introduction of an instrument, in which case hot blankets and bottles should be applied to the body, and a full dose of opium given ; if they then continue or become severe, it may be necessary to take out the catheter, although, especially if much obstruction be presented in effecting its passage, it will be undesirable to remove it on account of a slight attack of shivering, which may be only a transient effect of that operation. Let this be more especially borne in mind, since one of the indications for the adoption of this course of treatment is that peculiarity of constitution in the patient which renders a shivering fit the almost invariable consequence of every attempt at instrumental interference with the urethra. If the urine becomes deeply tinged with blood, as it sometimes does after forty-eight or seventy-two hours, it is advisable to remove the catheter, and substitute one of gum elastic.

But all these are exceptional results. Generally speaking, the pain is not severe, and after the lapse of twenty-four or thirty-six hours a purulent discharge is seen around the instrument, which soon becomes loose in the canal, and, if not properly tied in, may readily slip out, although when first introduced it was firmly retained by the stricture. Speaking in general terms (for it will be obvious that no exact directions as to time can be given), in about forty-eight to sixty hours from the first introduction the catheter should be replaced by another, which in any case is now to be a flexible instrument, by means of which the treatment is now to be carried out.

But there are certain rules which it is essential to observe in order to do this safely and easily.

I. The catheter is always, if possible, throughout the treatment, to be one of gum elastic, and of English make, which is superior for this purpose to the more flexible French, from the greater power of the former to resist the destructive action of the urine.

II. In tying-in the catheter, care must be taken that the end lies only just within the cavity of the bladder. An inch or two of catheter there is a source of irritation to the organ, acting, indeed, like a foreign body, as it is. There is no difficulty in accomplishing this object if, the patient being upright, urine is passed through the instrument. By drawing it out a little, while the urine flows, the spot at which the stream stops is observed; then reintroducing the instrument a little, it is to be secured when it arrives at the spot at which the stream again flows.

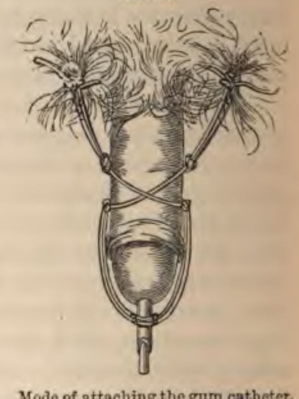
III. The catheter is always to be small enough to pass easily, so that even when first introduced it lies loosely in the canal.

If, when it is necessary to introduce a larger instrument, one is used which is quite as large as the stricture will admit, pain and irritation will be produced, and the progress will be less satisfactory. Every time the catheter has to be exchanged for a larger, an instrument is to be passed which is at least two numbers less than the size which the stricture will absolutely admit.

The exact time which it is desirable to carry on the process must depend upon the progress made in dilating the stricture. Nos. 5 or 6 having been reached, as will probably be the case in a few days, the patient may be allowed to leave his bed and spend his time during the day in a chair, which will be a great relief, and thus the dilatation may be carried on up to No. 11 or 12 English scale, when the catheter may be removed altogether. The introduction of an instrument must now be regularly resumed, at first every day, and then every second or third day, in order to secure permanency in the results already obtained, gradually lengthening the intervals as before described, but not wholly discontinuing the use of the sound for a considerable period; for it must not be forgotten that the subsequent tendency to contract is often strong, although in this manner its effect may sometimes be partially obviated.

When a slender silver catheter is employed at the outset, as the only instrument capable of being carried through the stricture, it may be fitted with a movable curved tube, for convenience' sake, or not. (See fig. 36.) But with any catheter, as a substitute for the bent tube, it is easy to adapt, in order to remove the urine, a piece of common india-rubber tubing, about six inches long, and $\frac{1}{5}$ or $\frac{1}{6}$ of an inch in diameter. One end of this may be drawn over the end of the catheter, and made secure, if necessary, by tying; the other is placed in the vessel used as a receiver. This may be close at hand, under the bed, or at any distance preferred. As soon, however, as it is possible to replace the silver by a gum catheter, this latter may be secured in its place by means of soft cotton bobbin tied fast to the catheter close to the meatus, and then loosely, in loops securely knotted, round the penis, with enough of 'slack' to permit erection to take place without pain, and finally fastened to the hair of the pubes, as shown in the annexed figure. (Fig. 37.)

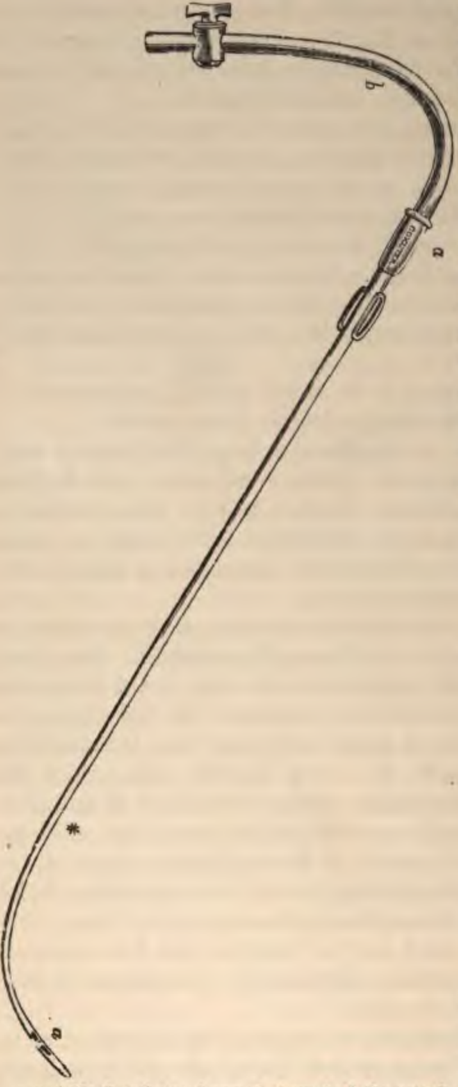
FIG. 37.



Mode of attaching the gum catheter.

Respecting the nature of the action set up in the urethra by the continued presence of a sound, it has

FIG. 36.



*a*, *a*. A No. 1 catheter, drawn of about half the actual size. The upper or open extremity is enlarged to fit the movable siphon *b*. Each catheter in the set has its upper extremity of exactly the same size.

* indicates the spot above which the shaft begins to enlarge as it rises towards the upper extremity; below it the instrument has the uniform size of the register for about three inches. For very small silver catheters, such as No. 1 and under, the shaft of the instrument should be equal in size to that of a No. 2; the latter three or four inches of the instrument only being of the size indicated by the register. This plan of construction gives firmness to the shaft, while it in no way interferes with the passing of that part of it which has to be introduced through the obstruction into the bladder, unless, indeed, the stricture be in the anterior part of the canal, in which case a catheter of the ordinary make will answer exceedingly well. For all larger sizes, the calibro of the catheters may be uniform throughout.

been usually said that the absorbent vessels are excited to unaccustomed activity, and that in this mode the tissues are removed; the correctness of this theory we have, however, no means of determining, neither do I think that it can be regarded as proven. It cannot be denied that a large and rapid derivation of organic material often takes place from the urethral mucous membrane, which must be regarded as contributing to the result. This discharge, often very profuse, is chiefly pus, with the *débris* of tissues, epithelium, and a few blood corpuscles. The process certainly does not remove the old fibrous material of the stricture, which is external to the mucous membrane, such as deposit in the corpus spongiosum itself, and which may be felt in the perineum as distinctly after as before the adoption of the treatment. The inner portions are perhaps carried away, but the continuance of the outer layer possessing as much contractility as ever, accounts for that strong tendency to return which is often displayed very soon after its employment, and which will soon prove troublesome, unless by continued occasional dilatation the calibre of the urethra is preserved.

**Sliding Tubes.**—Among various forms of special apparatus for effecting the dilatation of stricture, I may here describe a contrivance long ago employed by Mr. Thomas Wakley for removing one of the difficulties already named as an indication for tying-in the catheter, viz. the uncertainty of being able to replace a small instrument which has been passed with great difficulty if it be withdrawn. In the treatment of a narrow stricture by this method, a very small catheter is first carefully passed into the bladder. Into the end of this a small steel rod is screwed, and the whole forms what is termed the urethral guide. A straight silver tube is now passed over it through the stricture; so that the route being at first correctly taken, all future efforts will to a certainty be made in the same direction, and with greater ease than if the first, or 'urethral guide,' were not present.

The same principle directs every step of the dilating process; that is to say, each succeeding instrument may be slipped through the stricture over that which had been originally introduced. In treating a stricture by continuous or permanent dilatation, a tube of elastic gum is introduced in the same manner, and the original guide is withdrawn.

Undoubtedly this plan appears to possess certain advantages for those who are not practised in the use of instruments in the urethra, as, provided that the guide is passed fairly into the bladder, the same route is secured for the tubes which are to follow. But the first step in the process, viz. the introduction of the guide, is precisely that with which all treatment, whatever its kind, necessarily commences; and it is the most difficult and most important step. Once accomplished, the next steps are less difficult, often comparatively easy, whatever the method employed; and the success attained depends less upon any particular apparatus, than on the tact and skill of the operator, which after all constitute the great essentials in the management of stricture.

A different method of using sliding tubes was formerly adopted by Dr. Buchanan, of Glasgow. This instrument, which was called the compound catheter, consisted of a probe-pointed wire, upon which a small silver tube was made to slide closely; over this another, and on that a third, glided in a similar manner. Each was a segment of a circle twenty-three inches in diameter, so that while the instrument was curved, the sliding action should be easy. The urethral ends of the tubes were bevelled off, and the apparatus was passed and employed as a whole, the object being to introduce any one of the tubes through the stricture which it would admit, and then pass larger tubes over the first.[1]

M. Maisonneuve, of Paris, has employed both the sliding tube and the action of the wedge, in the treatment of stricture. In a memoir addressed to the Académie des Sciences, in January 1845, he thus described the following method, as having been adopted by him, for cases of retention of urine from stricture, through which it was difficult to pass a catheter. 'It consists in introducing, first a fine and flexible bougie, which, moulding itself to the inflexions of the canal, arrived invariably and without difficulty at the bladder; and then in using this bougie as a conductor over which to slide an elastic catheter open at both ends.'

It is remarkable how frequently the application of this principle has been originated by surgeons of different countries, independently of each other. Thus it was employed by Dr. Hutton of the Richmond Hospital, Dublin, in 1835.[2] Several French surgeons, among them M. Maisonneuve, have, at different times, claimed the application as a new invention. Can the fact have been overlooked that they were employed by Desault in the last century? When false passages existed, and there was more than usual difficulty in passing an instrument into the bladder, he employed a small elastic catheter, open at both ends, but containing a stylet with an olive-shaped extremity, to close the end introduced into the urethra. Having reached the stricture, he withdrew that stylet and passed another, two feet long, through the catheter into the bladder, then drew out the latter over it, and upon the same conductor slipped in another, and a larger instrument.[3] An instrument of much the same kind

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[1] *London Medical Gazette*, 1841, p. 916. Plates. Dr. Buchanan states that he used this instrument first in 1831.

[2] Graves' *Clinical Med.* 2nd ed. vol. i. p. 555. Dublin, 1848.

[3] For a detailed account, see *Traité des Maladies des Voies Urinaires*, par P. J. Desault. Paris, 1797, p. 310. Edited by Bichat.

M. Pichauzel even received a prize for this method from the Academy of Medihas also been used here for many years, and is described at page 114.

More recently, M. Maisonneuve exhibited a method of dilating very narrow strictures, by using his small conducting bougie in a different manner. Having passed it through the urethra, he screws upon the end which projects from the external meatus, another flexible bougie, a size larger than the first, and pushes it also through the urethra, the conducting bougie at the same time entering the bladder, and becoming rolled up there as it is supposed. The second instrument is followed by a larger, and so on, until by a series of instruments the stricture is considerably dilated at a single sitting.[1]

**Method by Expansion.**—A certain amount of objection has been generally admitted to lie against all the instruments at present described, on the ground of that abrasion of the urethral mucous membrane due to friction, which the passage even of a sound or catheter through a stricture with any degree of difficulty must tend to produce, and it equally applies to the sliding tubes just described, however accurately and smoothly they may be finished by the maker, since with all some amount of force is necessarily expended on the walls of the canal, and a proportionate degree of injury may be produced. Hence it has occurred to many surgeons to contrive an apparatus, which, being introduced with ease into the contracted part, should admit of being expanded there, and thus act by eccentric dilatation only, without the risk of injuring by friction.

With this view Dr. James Arnott, nearly seventy years ago, endeavoured to apply fluid pressure to the dilatation of stricture. He effected this object by passing a varnished silk tube, lined with gut, through the contraction, and distending it with air, water, or mucilaginous fluid, and making pressure by means of a syringe connected with it.[2] For general employment, however, little can be said in favour of this contrivance. A stricture cannot be very narrow, much less difficult to treat, through which such an apparatus can be made to pass, and can be quite as well dilated by the ordinary sound. In a little pamphlet recently published by Dr. Arnott, it is stated that the apparatus, 'when made expressly for the purpose, will enter a very tight or narrow stricture.' (P. 16.) The following remark, however, which subsequently appears, must be added: 'It is indeed more difficult to use a fluid dilator than a bougie, and the surgeon himself ought, if he wishes a perfect apparatus, to be to a certain extent his own instrument maker.' (P. 19.) But cases of stricture which are

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cine of Bordeaux in 1810. After that Amussat employed it. M. Rigal recommends it: *De la Pierre*. Paris, 1829, p. 22.

[1] *L'Union Médicale*, May 26, 1855.

[2] *Stricture of the Urethra*, by James Arnott, M.D. London, 1819, pp. 96 *et seq.*

fairly permeable are not generally difficult to manage, and complicated apparatus is wholly unnecessary for their treatment. The principle is a good one which has for its object the substitution of expansion for dilatation, by means of the wedge, which latter is that by which sounds act, as far as their mechanical operation is concerned; but a simple, and at the same time efficient, mode of applying it to narrow stricture is, and probably will long be, a desideratum.[1]

Mr. Luxmoor attempted, nearly eighty years ago, to supply the desideratum by employing a metallic instrument with four blades, which, by means of a screw, were made to expand, *in situ*, to any extent required, in four opposite directions.[2] Many years later, Leroy D'Etiolles adopted the same principle in the construction of some dilating instruments; and, more recently, M. Perrève, of Paris, attempted to fulfil the same object by an instrument formed of two blades united at the extremity, which, by means of a screw, can be separated from each other after they have passed into the stricture.[3] The imperfection of this arrangement consists in the dilatation being made in one direction only, viz. laterally, while an interval is created between the separated blades, into which the mucous membrane of the urethra is apt to protrude and to become injured by their edges. But he obviated this by passing a tube upon a slender guiding-rod, between the blades; so that, while the dilatation is effected mainly in the same manner as before, by the separation of these blades in a lateral direction, the interval is filled by the intervening tube. Subsequently he passes larger tubes, so as to effect dilatation on the same principle, from a No. 3, the smallest size of which an apparatus is capable of being made, up to any calibre desired. (See fig. 38.)

**Rupture.**—Several years ago, the instrument of Perrève just described was adopted by Mr. Holt, but employed in a different manner, i.e. not for dilatation at all, but for forcible rupture of the stricture. His mode of proceeding was as follows: Having introduced the apparatus through and beyond the stricture, which may be supposed capable at most of admitting a No. 3, he passed at once a tube of the size of No. 10, which, with the expanded blades, opens the stricture to at least No. 12. This operation, usually performed under chloroform, often required considerable force. The instrument being withdrawn, a No. 10 catheter was passed into the bladder, and at once removed. Some bleeding usually followed at the time, and continued for a few hours, rarely more than twenty-four, but only to a slight extent. The stream was at first considerably improved; and contrary to what might be expected, there was not invariably any shivering or fever. A bougie was passed on the second day after the operation; on the fifth or sixth; then once a week for two or three weeks; then once a fortnight; and, lastly, once a month.

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[1] For other methods of applying expansion, see:

Instruments with Expanding Blades, by Civiale; *De l'Urétrotomie.* Paris, 1849. Plates.

Leroy D'Etiolles' method by several metallic rods, *Thérapeutique des Rétrécissements de l'Urètre.* Paris, 1849, p. 28, plate.

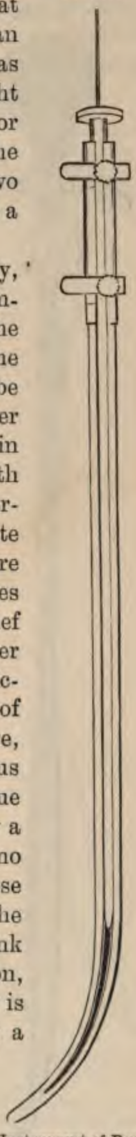
Reybard's Method by two Metal Blades, *Traité Pratique.* Paris, 1853, pp. 229, 230, plate.

Compressed Sponge, *Gazette des Hôpitaux*, June 1854.

[2] *Practical Observations on Strictures*, with plates. London, 1812. By Thomas Luxmoor, Surgeon Extraordinary to the Prince Regent, &c.

[3] *Traité des Rétrécissements*, &c. &c. par V. Perrève. Paris, 1847.

FIG. 38.

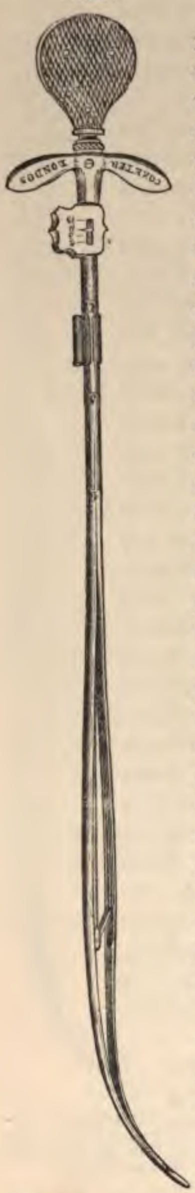


Instrument of Perrève, of Paris. Copied from his work published in 1847.

The plan has been adopted widely in this country, although not elsewhere. It possesses the attribute of simplicity, and is exceedingly easy to perform, for provided the first instrument, or guide, is safely passed through the stricture into the bladder, the introduction of the large tube which effects the rupture is accomplished merely by sheer force. That the operation has held its ground to a certain extent is no doubt in great measure due to the facility with which it is performed. I cannot say that the results warrant a recommendation of the practice; the immediate consequences are sometimes serious, the remote ones are often disappointing. The recontraction which sometimes follows is considerable, and appears after only a brief interval of improvement. In applying force in the manner described, a rent takes place in the situation of the stricture, and it is certain that this must occur on that side of the urethra which offers least resistance; that is, therefore, the more healthy side, the least affected by the fibrous elements of the stricture. Hence, no division of that tissue is made, and the new rent is probably often followed by a new cicatrix, and the subsequent condition will at no distant period be notably worse than at the first. Those who have been trained by experience to appreciate the value of care and of delicate handling, naturally shrink from applying violence to the urethra in so rude a fashion, and believe that a well-performed internal urethrotomy is more enduring in its results than any other proceeding; a question to be fully discussed hereafter.

About the same time, with the view of adopting the principle of expansion from within, I employed for a good many cases a method to which I gave the name of 'over-distension,' and which consists in applying force, directed from within outwards, by means of two blades previously passed through the stricture. The object being to distend, or to rupture if preferred, up to a higher calibre than can be accomplished by means of any instrument the size of which is limited by the external meatus of the urethra.

FIG. 39.



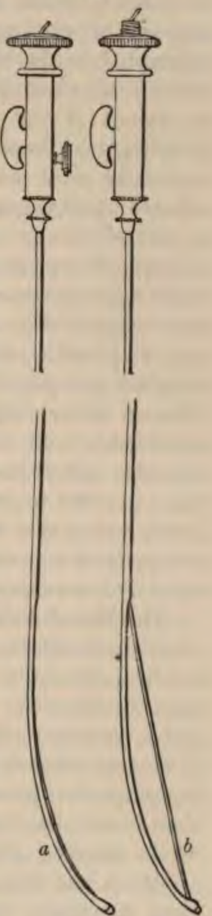
The instrument, which in itself is by no means novel in construction (such mode of effecting dilatation having frequently been employed before), was used to enlarge the urethra at one sitting. A reference to fig. 39 will explain its construction. The reason for carrying distension beyond the size which the meatus of the urethra will admit, is the fact that a large number of strictures occupy a part of the canal, the bulbous portion, which naturally possesses a calibre of at least 16 or 18 of the catheter-scale (English), and that ordinary dilatation up to No. 12 inefficiently acts upon them. The method of applying the power by this instrument differed materially from that in others, in being made slowly (better, therefore, under the influence of chloroform), so that from seven to ten minutes were occupied in slowly reaching the maximum point of distension; the object being to overstretch the morbid tissues as much, and to rupture them as little, as possible, in order to destroy, or, at all events, to greatly impair, the natural tendency of the stricture to contract. Before operating, the distance of the stricture from the external meatus is measured by passing a full-sized bougie down to the stricture; the slide is then placed upon the figure on the stem which denotes that distance. The instrument is passed until the slide arrives at the meatus; when the maximum distension is reached, the screw is turned back a little, so as not to close the blades; the instrument is withdrawn; a full-sized gum catheter is passed, and allowed to remain twenty-four hours. On the third day after the operation, a large metallic sound is passed, and subsequently at longer intervals.

If it is preferred to rupture instead of to distend to the same degree, the handle must be rapidly turned, and in a few seconds the full size named can be attained.

Having adopted this method for some little time, I soon found that the instrument was more efficient when employed rapidly to rupture, or as a divulsor, than by way of a dilator. In this manner has it been employed in

America, where several operators have reported favourably of their experience, notably Dr. Gouley of New York,[1] who has modified it by making the lower portions of the diverging blades cylindrical instead of flat, and adapted it also to the principle of his 'tunnelled sound' described at page 112. For myself, having preferred for many years internal urethrotomy on a principle hereafter to be described, I have ceased to employ any form of divulsor.

FIG. 40.



*a.* The instrument as it is passed through the stricture.
*b.* The instrument with the wire emerging and made tense.

Professor Corradi, of Florence, a few years ago introduced another mode of partly dilating forcibly, partly dividing (?) a narrow stricture which admitted an instrument not exceeding No. 2 English. It was of course equally applicable to any stricture which at first narrower had been dilated to that calibre. The instrument consists of a steel curved director in which lay a steel wire, which at first concealed, could after being passed through the stricture be gradually tightened, while *in situ*, forming a chord to the arc of the circle formed by the instrument. The accompanying woodcut will explain the action fully. (Fig. 40.)

**Rapid Dilatation.**—This term and the practice it describes have nearly if not quite lapsed into oblivion. The proceeding by rupture, whatever else it may do, must of necessity render wholly unnecessary any resort to the violent measures employed as 'rapid dilatation.' Systematically adopted, especially by French surgeons, in past time, a frequent resort to it in practice has always called forth the reprobation of prudent surgeons. Certain it is that rude attempts at dilatation, especially by means of metallic instruments, are not only useless but mischievous.

Irreparable mischief may very easily be done in this manner, as has been already pointed out, and often owing to a circumstance not sufficiently, I think, considered. I refer to the fact that when forcible efforts are made to pass a firm bougie or a metal dilator through a stricture, the narrowed portion of the urethra is often driven inwards to a very considerable extent, instead of being itself penetrated by the dilating instrument. In this way, much violence may easily be inflicted on the connections beneath the mucous membrane, and great irritation be produced in the surrounding parts in a manner of which the operator is evidently quite unconscious. Inflammation of the urethra and bladder, which in patients labouring under chronic disease of the kidneys may soon extend to these organs and be followed by fatal consequences, has been not unfrequently thus induced. In some circumstances disaster is liable to follow efforts to dilate the urethra, after the maximum amount of distension has been reached, when an operator has attempted, in the treatment of an old stricture, to dilate to a degree beyond what had been his previous habit, although perhaps only to an extent of one or two sizes of the catheter scale. With elderly patients, who have long been the subjects of stricture; with those especially who possess an irritable temperament, who are readily affected by changes of season or weather; with those who have lived in hot climates, whose powers of life are feeble; with those who throughout a great portion of their lives have habitually used stimulants with freedom; in short, with all whose nervous powers have been exhausted in any way, it is necessary to exercise more than ordinary caution in the use of dilatation for an old stricture and to rest satisfied with a condition of it which will admit Nos. 6, 7, or 8, if an indication in the shape of a rigor, invariably occurring at any attempt to exceed this limit, admonish us not to go beyond it. Such patients are tolerably safe if they do not neglect the weekly passage of an instrument in order to prevent the contraction which is certain to take place if this precaution be neglected. This of course refers to those very few patients whose cases are not suitable to the employment of other operative measures.

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[1] *Op. cit.* p. 60.

**The Use of Anæsthetics.**—The influence of anæsthesia is sometimes useful in facilitating the passage of a catheter or sound through the urethra, especially when it is more than ordinarily sensitive, and the pain occasioned by instrumental interference produces uncontrollable and involuntary efforts of resistance on the part of the patient. Let it be remembered that ether or chloroform are administered not for the purpose of permitting the instrument to be used with greater force than before, but in order to produce perfect anæsthesia and relaxation of the muscles, and enough must be given to insure this result.

Much has been said about the value of belladonna, applied in the form of extract to the face of the stricture by means of a bougie, or to the external surface of the perineum, in overcoming difficult obstructions, and successful results are accounted for by presuming that, in cases in which the difficulty is chiefly due to spasmodic muscular action, the drug acts by relaxing the muscular tissues, as it does in the iris. It will be unnecessary to enumerate the recommendations of its employment, which have appeared in the form of reports, but it should be stated that in this country, Mr. Tyrrell, formerly of

St. Thomas's, and in France, Velpeau, have given evidence in favour of its powers. In most, if not all, of the reports met with, its employment has been accompanied by other treatment, so that it would not be possible to form an opinion of its independent effects. Thus, in one of Mr. Tyrrell's cases, it is said, 'Mr. Tyrrell ordered . . . a bougie, rubbed over with belladonna and oil, to be passed into the urethra. Soon after the man came from the bath this was tried, and after two or three attempts the bougie (which was larger than those used before) readily passed the stricture, and the bladder was emptied of its contents.'[1] There are indeed no grounds whatever for attributing any value to this mode of using the agent.

**Constitutional Treatment.**—Whatever is done locally for a difficult case, it is mostly advantageous to secure repose for the patient, and attention to his general health. When an obstinate case presents itself, and a patient will occasionally be met with who states that for some years past no instrument has ever been passed into the bladder, although the attempt has been frequently made, and if the operator's mind is satisfied, after two or three trials, that more than ordinary difficulties are presented, the best plan is to enjoin perfect quiet for a few days in the recumbent position, a mild unstimulating diet, and any medicinal remedies which may be indicated in order to allay irritation of the urinary organs. Indeed, the urethra, in confirmed stricture, sometimes becomes and continues extremely sore and tender, and shows a disposition to contract rather than improve, during ordinary dilatation. In these circumstances it is almost certain that the general health requires attention, or that the patient's ordinary habits are injurious; and that temporary rest from active life, and perhaps from mechanical interference with the stricture, are necessary. At the same time benefit may sometimes be obtained from the employment of the hot hip-bath, and by hot fomentations to the perineum and hypogastrium. The most effective method of employing the former is, to allow the patient to sit in the bath at a temperature which may vary, according to circumstances, from 100° to 105° or even 110°, for about ten minutes. Greater relief is often afforded in this way than by occupying a longer period at this or at a lower temperature. An impression is thus made upon the skin, its vessels are filled, derivation from the pelvic viscera is favoured, the reverse of which happens from the use of the prolonged bath. After such treatment the chances of success are increased, whereas, while the urethra is congested, perhaps lacerated by recent attempts, there is little good to be done by instrumental interference. The condition of the urine itself will afford indications for the kind of treatment required, and this should be carefully examined.

If the urine be unduly acid, and deposit much uric acid, or urate of ammonia, the digestive organs are not improbably deranged, and some mild aperients and 'alterative' treatment may probably be desirable. Associated with this, potash, as the liquor, or in the form of citrate, may also be useful. If the urine is alkaline, the bladder is probably not emptied by the patient's efforts, and the use of a catheter to evacuate the residuum must be postponed until the urethra is prepared to receive one, if with quiet and local bathing the condition does not improve. The well-known decoctions of pareira brava, or of uva ursi, or the infusion of buchu, or of alchemilla, render service if given in large quantity, from 10 to 20 ounces daily. The mineral acids may be perhaps useful, but have no direct action on the urine, and will not alter its reaction as alkaline remedies do; and it sometimes happens that these latter are, in this very condition, sometimes more useful than the acids. Dr. Owen Rees, who long ago called attention to this matter, expresses his opinions at length in a valuable paper in the Guy's Hospital Reports, 1855, an extract from which is placed below in a foot-note.[1] He recommends those salts in which the alkali is combined with a vegetable acid, especially the citrate of potash and the tartrate of soda and potash; the latter if the bowels require a laxative, and the former if this is not the case. Both exercise a powerful influence in neutralising the acidity of the urine, notwithstanding the aperient action which is associated with one of them. I have had opportunities of witnessing the good effects which result from their employment, although the alkaline treatment is not invariably successful. For directly acidifying the urine, lemon-juice may be employed as an agent; while benzoic acid is another but less manageable one, owing to its insolubility in water. The condition of the patient's general health, when not good, affects the local complaint. In many ways, derangements of the digestive organs in particular exert an influence upon the urethra. Moderately free, but by no means active relief of the bowels should be secured by diet and occasional laxatives, and the functions of the skin should be stimulated by daily ablutions and frictions, in order to lighten, as much as possible, the duties of the kidneys.

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[1] *Medical Gazette*, vol. v. p. 735.

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[1] Dr. Rees 'believes that an alkaline state of urine very frequently resulted from disease of the mucous surfaces over which the urine had to pass before excretion; and that urine which had been secreted, of healthy acid character, was, owing to this condition of the membrane, often passed of strongly alkaline reaction, and containing a deposit of the earthy phosphates as a consequence. The patient, in fact, was secreting healthy urine; . . . the variation from the normal state consisting in the urine being rendered alkaline by disease of the mucous surface of the urinary passages. That the discharge from the urinary mucous membrane, when inflamed, was of a strongly alkaline character, and sufficient in quantity to neutralise the acidity of healthy urine, I proved by an experiment on the inflamed surface presented by the fundus of an everted bladder which I examined, in a case of deficient anterior parietes of the abdomen.'

'In confirmation of the above views, I took the opportunity of adducing the fact that in several cases of alkaline urine I had succeeded in obtaining the secretion of healthy acid reaction by administering alkaline remedies. These soothed the inflamed mucous membrane, by rendering the urine less acid on secretion, and, therefore, less irritating; and by perseverance in this plan till the inflammatory condition subsided, the normal acid reaction of the urine, as it passed from the bladder, was eventually obtained.'—*On the Pathology and Treatment of Alkaline Conditions of the Urine.* By G. Owen Rees, M.D. F.R.S. Guy's Hospital Reports, 3rd series, vol. i. 1855, pp. 300, 301.

There is no doubt that the passage of urine over a diseased and highly sensitive urethra, tends to aggravate the condition of the stricture; and that if the removal of the secretion could be provided for temporarily by another channel, the urethra would recover considerably in consequence. Hence Mr. Cock has, with this view, adopted puncture of the bladder as a means of treatment, not because the urethra is impermeable, and it has thus been in some cases a successful one. The indication for its employment is stronger if numerous fistulæ and much inflammatory mischief exist in the perineum.

**The Rationale of the Action of Dilatation,** a mode of treatment generally acknowledged to be applicable to many cases of stricture, has frequently formed a topic for discussion among surgeons. Some have regarded the action of an instrument upon the stricture as purely mechanical, believing that it enlarges the passage, the walls of which are composed of extensible materials, just in the same manner as a tight glove may be stretched to suit the wearer's proportions. Others have attributed to the act of pressure some power of producing absorption, and consequent removal of the organised materials of the obstruction; and such reject the notion of dissipating a permanent stricture by the mere mechanical action as untenable, or at least improbable.

I have long sought to obtain, by observation, some clue to the rationale of the action of dilatation, as a means of cure in stricture. And I think, by regarding closely certain phenomena which accompany its employment, we may obtain some little light upon the subject, and a hint or two useful in practice.

The first effect of passing an instrument gently through a narrow stricture (speaking in general terms, and not of exceptional cases), such an one, for example, as will only admit an instrument of the size of about Nos. 2 or 3 without much pain or irritation, is that an increase in the size of the stream is noted by the patient on the first succeeding act of micturition. But in the course of a few hours afterwards the stream is observed to be narrower than it was before the instrument was introduced; there may be even a temporary attack of retention. Subsequently, the stream gradually regains its previous size and force, and in a day or two probably exhibits a degree of enlargement, as the final result of the catheterism employed. The increase, however, is rarely quite equal to that which appeared at the first act of micturition following the operation.

Now, the first or immediate improvement must clearly have been due to the mechanical action of the dilating body on the stricture. No one will imagine that absorption could have taken place so rapidly as to produce that effect: it was, doubtless, mechanical only. The next result observed, or that of diminution of the stream, may be regarded as the consequence of some temporary congestion of the part, arising from the slight degree of irritation necessarily occasioned by the foreign body introduced, a phenomenon which may be designated by the term *reaction*; and this reaction will correspond, other things being equal, with the degree of pressure exerted, and with the amount of sensibility possessed by the urethra. The third and final result is that of gradual increase in the size of the stream, indicating the stage of *subsiding reaction*; during which congestion disappears, and at the same time the removal by absorption of some portion of the original deposit forming the stricture may possibly take place; but from the strong tendency which all strictures have to reappear, it appears very doubtful whether, after all, the action of the bougie has been more than mechanical. The rapidity with which these actions follow one another, and the extent to which they are developed, vary greatly in different individuals. It is the existence of undue sensibility in the urethra, or its disposition to exhibit the phenomena of reaction with rapidity and intensity, which in a great measure constitutes that condition of a stricture which we commonly understand as 'irritable;' and the extent of which irritability correspondingly prolongs or retards the progress of cure. It is during the last stage, that of subsiding reaction, that the vital or permanent effect (as distinguished from that which is merely mechanical and transient) is obtained.

Granting that these observations are correct, an explanation is afforded of the fact that nothing is gained by shortening unduly the interval of time permitted to elapse between each consecutive application of the catheter; but that, on the contrary, considerable irritation may be sometimes thus induced by passing it too frequently. Calling to mind that the essential nature of organic stricture is a deposit of organised material in and around the urethra, occasioned by inflammation, it must be a principle of treatment to avoid producing any renewal of that action. A repetition of the catheterism should never be made until what has been termed the period of 'reaction' has subsided, and the disturbing effects of it have disappeared. If we pass an instrument during that period, we increase or prolong reaction without attaining the permanent benefit of the process which would have succeeded it. We may pass instruments every day, but if on each occasion this is done before the period of reaction has disappeared, we shall not only fail to advance, but we shall probably intensify that condition, or convert it into one of inflammation, and thus increase an evil which the instrument, less frequently employed, would effectually obviate. The rule which must guide us in applying dilatation, both in regard of the extent to which it is to be carried at the time, and of the proper length of the interval which is to elapse between each repetition of it, is to exercise just so much mechanical pressure as can be exerted without producing much pain, much less the signs of inflammation, and not to re-apply the instrument during the period of reaction, that is until any excitement produced by the previous catheterism has completely subsided. The fulfilment of these indications will conduce most safely and certainly, and, in the long run, the most quickly to a successful result.

From this point of view, we may at once perceive how it is that dilatation, rudely or too rapidly performed, although apparently successful at the time, is likely ultimately to increase the evil which it was intended to avert. Thus it is that a patient with confirmed and long-standing stricture has sometimes observed that his complaint has reappeared sooner than before after each succeeding course of treatment. For, probably, the catheter has been employed with undue force or frequency, inflammation of the urethra has been set up, occasioning fresh deposit in and around the existing stricture, a result which is destined to render it ultimately more obstinate than before.

It is probably due in great measure to a disregard of the rule laid down, that dilatation has been by some under-estimated as a therapeutic agent. And thus it is that complicated machines in almost inexhaustible variety have been designed for the purpose of forcibly dilating, and even of cutting out the urethral obstruction. The construction of these appears for the most part to be based on the notion that the urethra is a tube possessing merely mechanical properties, and that its obstructions may therefore be treated by the application of merely mechanical powers. If, however, dilatation be employed, by steps sufficiently gradual, and with special care not to produce irritation, such as by using the softest instruments, the result will generally be satisfactory, not merely in mild cases, but in those of no ordinary severity. But if, while opening the contraction by dilatation, we at the same time irritate unnecessarily or inflame the parts acted upon, we shall at best only afford temporary relief to the complaint at the expense of its future augmentation. Employed in this way, dilatation is assuredly not a satisfactory method of treating stricture.

Reasoning from the phenomena observed, one might perhaps infer that most examples of stricture contain two structural elements, physiologically considered, or of one element in two different degrees of development (which is immaterial to the present question)—the one, absorbable; the other, non-absorbable. The former is supposed to be removable by the action of dilatation; the other not so, but only amenable to mechanical distension, the effect of which is temporary. The relative proportion, then, of these two elements determines the degree of success which dilatation is capable of accomplishing. Possibly a few strictures may, in their early stage, be composed of materials to a considerable extent absorbable, the progress of time producing the unyielding tissue which is only temporarily distended by the process. When dilatation fails to produce benefit, as for example in confirmed and indurated strictures long known for their marked contractility, it is probable that the absorbable element is present in very small proportion, and that section of some kind is necessary to confer complete relief.

In summing up the subject of dilatation, although there are few cases indeed in which, with care and perseverance, an instrument cannot be passed through the stricture, and, consequently, in which some dilatation cannot be pursued, there are unquestionably some in which its effects are so temporary that its claim to relieve, far less to cure, must be disputed. This is now an admitted fact. Every surgeon who has had anything like extensive experience in the treatment of stricture must have met with such instances. The contraction reappears, and that so rapidly, that in order to maintain a canal sufficiently patent for the performance of its functions, an instrument must be passed every other day, or even oftener, and thus the patient is subjected to perpetual treatment, and to the confinement and condition of dependence consequent thereupon. While, in a few cases, the urethra is so acutely sensitive that existence is rendered miserable by the torture which the patient has constantly to endure, and the introduction of sounds, instead of producing any beneficial effect, increases the evil and exaggerates the symptoms.

The question is therefore unavoidably presented: Can permanent relief be obtained for such cases, and, if so, by what method? The consideration of this will lead to a brief inquiry relative to the employment of chemical agents in the treatment of stricture.

## CHAPTER VIII.

### THE EMPLOYMENT OF CHEMICAL AGENTS IN THE TREATMENT OF STRICTURE.

No better proof exists, if such were wanted, that the process of dilatation is not a universal and complete remedy for stricture, than the fact, sufficiently notorious as it is, that innumerable methods have been recommended on high authority to supply its deficiencies.

Thus we find early records, in the writings of the old surgeons, of proceedings which they practised when the use of the wax bougie or leaden sound had proved insufficient to overcome what were believed to be '*caruncles and carnosities*.' Incisions were made at the obstructed part by means of instruments passed through a canula, and by the same means escharotics also were applied. These, which were extremely numerous and potent, are detailed, and their mode of applying them described, by several writers in the sixteenth century, among whom are Alphonzo Ferri, Amatus Lusitanus, Andrea Lacuna, Philippus, Christopher de Vega, and Francesco Diaz. The three first named appear to have been the earliest authors of monographs on the subject, and from them we learn that they employed bougies smeared with ointment containing verdigris, butter of antimony, quicklime, arsenic, alum, vitriol, &c. &c.[1]

In the year 1603, Mayerne, of France, operated by incisions upon Henry IV., for which he was severely censured by the Faculty of Medicine of Paris; and Jean Baptist Loyseau, of Bordeaux, afterwards successfully treated the royal patient with escharotics—that is, by means of bougies containing savine, a result for which he was created surgeon to his Majesty. Still later, in the works of Ambrose Parè, the surgeon is recommended to pass through the catheter 'a silver wier, sharp at the upper end,' . . . 'that by oft thrusting it in and out, it may wear and make plain the resisting caruncles.' After this comes the description of a catheter with 'prominent cutting sides, upon which, after it has been thrust into the urethra, the yard is to be pressed on the outside close, with your hand, in the place where the caruncles are.' Next an escharotic is to be applied in the manner following: '℞ Herb. sabin. exsic. ℥ij.; Ocræ, Antimon. tut. præp., ana ʒss. Ft. pulv. subtile. Put the powder into the pipe or catheter having holes in the sides thereof . . . then put the catheter into the urinary passage until the slit or openness of the side come to the caruncle; then into the hollowness of the catheter put a silver wier, wrapped about the end with a little linen rag which, as it is thrust up, will also thrust up the powder therewith, until it shall come to the slit against the caruncle, then will it adhere to the caruncle, bloudy by reason of the said attrition.'[2]

Richard Wiseman, who practised during the latter part of the seventeenth century, and who was serjeant-chirurgeon to Charles II., gives elaborate instructions for a long course of physic, as well as for the composition and use of medicated bougies, for the extirpation of

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[1] *De Caruncula sive Callo.* By A. Ferrius. 1551. Chap. ix.; in the *Thesaurus Chirurgiæ* of Uffenbach. Frankfort, 1610, p. 1015. *Curationum Med. Cent. quat.* By Amatus Lusitanus. Ven. 1557, pp. 537–542. *Method. Cognosc. et Extirp. Excresc.* By A. Lacuna. Romæ, 1551.

[2] The works of Ambrose Parè. Translated by Johnson. London, 1678, pp. 443–445. An engraving of the instrument alluded to is appended.

'caruncles and carnosities' in the urethra; and moreover directs, that in cases in which this treatment is not successful, 'you may pass a canula into the urethra to that caruncle, and whilst you hold that there steady, you may convey a grain of caustic into the canula, and press the caustic to it, and whilst you hold it there you will perceive its operation by the pressing forward of the canula.'[1]

In the very commencement of the eighteenth century, Dionis gave instructions in his well-known 'Cours d'Opérations de Chirurgie' for applying caustic to those strictures through which a probe could not be insinuated, in the following manner. He applied the caustic agent to the end of a wax bougie, and introduced it as far as to the stricture, leaving it there for some time. By this means, he says, a small portion will be consumed and thrown off. This process was to be repeated every day, and continued until the passage was free. The surgeon is warned not to be in too great haste, nor to use caustic too strong, lest it should cause inflammation and retard the cure. Afterwards dilatation is to be kept up for a short time, as well as the application of 'desiccative liquors,' by means of a leaden probe rubbed with quicksilver, in order to keep the passage open 'until it cicatrise anew.'[2]

In our own country, at the latter end of the eighteenth century, John Hunter called attention to the use of escharotics by his writings and practice. The idea of cauterising stricture appears to have been an original one with him. After trying the effect of red precipitate in his first case without success, he confined himself to the employment of nitrate of silver, and, in explaining his views respecting its action, commences by laying down the axiom, that where a bougie can readily pass there is no necessity for the use of any other method. But that inasmuch as the stricture may be too tight to admit one, a condition which, he says, 'very rarely occurs,' or may not be in a line with the urethra, or the canal itself may be obliterated altogether, the caustic will be found for such cases a most efficient remedy.

The mode of application was as follows: he first passed a canula down to the stricture, and through it introduced a small porte-crayon containing a piece of caustic, which he allowed to remain in contact with the obstruction for one minute, repeating the process, if accidents did not occur to interfere, every other day. As soon as the stricture admitted a bougie, the treatment thenceforth consisted in simple dilatation.[3] He confesses that when the contraction is of some length, and irregular, he should fear to continue the use of the caustic sufficiently long to reduce it. After more experience, especially of the difficulty of applying caustic accurately to obstructions situated at the sub-pubic curvature, Hunter abandoned the canula and used what has been since called an 'armed bougie.' This consisted of an ordinary wax bougie, in the end of which was embedded a small piece of nitrate of silver; this was passed rapidly down to the stricture, retained with a moderate degree of pressure against it for about one minute, and then withdrawn. This appears to have been precisely similar to the method of Dionis as regards the manner of application.

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[1] Works of Richard Wiseman, 6th ed.; published after his death, in London, 1734, vol. ii. p. 413.

[2] *Cours d'Opérations de Chirurgie*, par Dionis. Paris, 1708, p. 189.

[3] *Op. cit.* 2nd ed. pp. 125–128.

After this, Sir Everard Home, who was a pupil of Hunter, not only continued to employ this agent according to his master's directions, but extended its application to permeable strictures, making its use the rule, as we shall see hereafter, and that of simple dilatation the exception, which latter he appeared to consider adapted only to the mildest and most recent cases.

As already seen (p. 115), Sir Charles Bell improved on the methods of applying caustic hitherto employed, by first carefully examining the urethra by means of the model bougie. By this means he believed that he was enabled to place the nitrate of silver in contact with the narrowed portion of the canal with more accuracy than his predecessors. His work, containing drawings of the instruments, is dated 1807.

At the beginning of the present century Mr. Whateley published a small volume, in order to advocate the superiority of the potassa fusa, as a chemical agent, to the nitrate of silver.[1] He considers that 'caustic, in any form or quantity, ought not to be used till a bougie, a little larger than one of the finest size, can be passed through all the strictures into the bladder,' lest retention should be caused; and makes this proceeding an indispensable prerequisite to the operation, stating, 'that in the worst and most contracted strictures he had ever met with, he had sooner or later almost uniformly succeeded in procuring a passage into the bladder by means of fine bougies.' His method of employing it was as follows: A plaister bougie is to be selected, which possesses sufficient firmness not to become soft and pliant in the urethra, and of a size just large enough to enter the stricture. This is to be passed down to the point of obstruction, and a mark made upon it with the finger-nail, exactly half an inch from the extremity of the penis. When withdrawn, its extremity is to be pierced with a large pin, and into the orifice thus made, a piece of fresh and hard caustic potash inserted, 'less than the size of the smallest pin's head for the first application,' sinking it a very little below the margin of the hole, pressing round it the end of the bougie, and filling up any vacancy with lard, to prevent the possibility of its falling out. The instrument is now to be oiled, and passed quickly down to the stricture, care being taken to ascertain that it has arrived at the required spot, by attention to the mark, and its relation to the extremity of the penis; it is now to rest there some seconds, then to be pushed gently forwards about an eighth of an inch, allowed to rest again, and then carried forward in the same gentle manner till it has got through the stricture. When this has been accomplished, it should be slowly drawn backwards and forwards through the contracted part two or three times, and then removed altogether. This process is to be repeated at intervals of a week, increasing the size of the bougie as it can be admitted, but taking care always to pass the bougie fairly through the stricture before arming it, that its passage then may be insured. At no time is the particle of caustic potash to exceed in weight the twelfth of a grain.

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[1] Whateley's *Improved Method*, &c. London, 1804.

In those rare cases in which he was unable to pass a fine bougie into the bladder, Mr. Whateley was accustomed to attach a small portion of nitrate of silver, a fractional part of a grain, to the extremity of a bougie, and press it against the obstruction. He preferred this agent to the caustic potash, which, he says, should be resorted to only if the former do not succeed, and then in exceedingly minute quantity as he considered the alkali too active an escharotic to be applied to a surface so limited in extent as the face only of a stricture. He also appears to be the first who systematically applied caustic to the inner surface of the stricture, which he did by applying to the end of a bougie of the smallest size, first a little glue, and then some finely powdered nitrate of silver, after which 'it may,' he says, 'be readily passed into, or a little beyond, such strictures as are extremely narrow.'[1] Subsequently, Dr. Jas. Arnott adopted and somewhat improved on Bell's method. Having by means of the model bougie ascertained the situation and calibre of the stricture, he passed down to it 'a canula having its extremity filled and rounded by a button,' which formed one end of a stylet, to the other end of which a dossil of lint was attached. The stylet being withdrawn, the lint was introduced to absorb moisture, and after its removal he passed down a slender metal rod, upon which, near its point, a thin film of the caustic had been made to adhere by fusing. The rod was made a little smaller at the part to which the caustic was fixed, so that after that process the volume of the instrument was equable throughout, and the layer of caustic, not projecting beyond the surface of the rod, was not rubbed off by its introduction within the stricture.[2]

In France the employment of caustic was revived in modern times by Ducamp, who, in a work on 'Retention of Urine,' published in 1822,[3] advocated Dr. Arnott's treatment at considerable length, although without acknowledging the author, and made some very slight additions of his own. Subsequently, Lallemand, Segalas, and others have suggested numerous modifications of these instruments.

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[1] *Observations on Home's Treatment*, &c. London, 1801, p. 68.

[2] *A Treatise on Strictures*, &c. London, 1819. And 2nd ed. 1840, p. 157.

[3] *Traité des Rétentions d'Urine.* Ducamp, Paris, 1822.

Up to about 1855 or 1860 caustics were still employed by some, and of these it is difficult to say which agent was most in repute. Mr. B. Phillips spoke in high terms of the curative powers of the nitrate of silver. But he approved only of its introduction within the stricture, and its application consequently to the diseased part alone, reprobating attempts to apply it to the face of an impermeable obstruction. In such a case he recommended a slight incision of the stricture within the urethra, in order to facilitate the subsequent passage of the caustic instrument. The method he employed is that which was designed by Arnott, and modified by Ducamp and Lallemand. The instrument consists of a canula and strong stilette, with the end of which latter is connected a small cuvette, containing some of the solid nitrate which has been melted into it; this is projected into the contracted part and revolved *in situ*, taking care that the caustic is not permitted to remain unsheathed for a longer period than one minute. This apparatus, which bears the name of Lallemand, is sufficiently well known, and needs no further description, a larger form of it being in common use for application to the posterior part of the urethra in other affections. But Mr. Phillips' subsequent remarks upon the use of caustics are valuable, as expressing a more matured opinion. They are as follows:

'There was a time when I felt a strong conviction that caustic was the most certain curative agent in the treatment of stricture; a longer experience has satisfied me that conviction was not well founded. I believe we know no means of effecting a permanent cure of advanced cases of stricture; but I think the best means we possess is the prudent employment of dilatation. You can always make the canal free by this means; and although it will commonly manifest a tendency to contract anew, yet the occasional introduction of a bougie may prevent the disposition from proceeding so far as to cause inconvenience. I do not doubt the cures that have been attributed to caustic, but in my opinion they have been mainly owing to the dilatation exercised by bougies and porte-caustiques employed in the treatment. I apprehend the good derived from the use of caustic is owing to the modification of the sensibility of the canal, which has allowed of a more unreserved use of dilating bodies than could have been had without it.'[1]

During the former half of the present century French surgeons appear to have used nitrate of silver largely. Leroy D'Etiolles wrote at length on the subject, and described peculiar methods of employing it. He likewise required, as a condition for its use, that the stricture should be capable of admitting an instrument, seeking carefully to avoid any contact of the agent with the healthy structures around, which he said inevitably tends to convert a short and simple contraction into a long one, by giving rise to inflammation. He disapproved of Lallemand's instrument because the cuvette is apt to be retained forcibly in the stricture by the spasmodic action which is almost invariably set up around it by the stimulus of the caustic, and is difficult to withdraw until all the caustic is dissolved. Hence he employed a canula, having two or three lateral apertures in it near the extremity, which is formed by an olive-shaped bulb. He selected a canula of a size that could be passed through the contracted part, and passed it as far as to the prostatic region; then, withdrawing it, ascertained the situation of the stricture by means of the bulbous extremity. He then passed down some nitrate of silver, attached to a flexible stilette, and cauterized the parts exposed at the apertures by rotating it. When very small instruments are used, the stilette will necessarily carry but a very small portion of caustic, in which case he recommended that two or three should be ready prepared to pass in succession down the canula, which is afterwards gently withdrawn. This method he distinguished by the term '*lateral retrograde cauterisation*.' The smallest size which can be used equals No. 3 English; so that if it be ever necessary to use caustic to a very narrow stricture, Dr. Arnott's simple method appears preferable.

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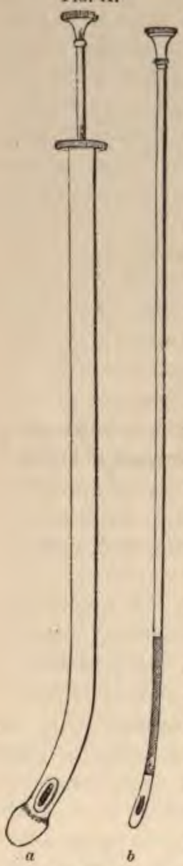
[1] *Medical Gazette*, December 1843.

FIG. 41.



Leroy D'Etiolles' instrument for 'lateral retrograde cauterization.'
*a*. The canula.
*b*. The caustic holder.

Mr. Wade was the last to use the caustic potash in this country, and he expressed himself very strongly in its favour. He applied it after the mode recommended by Whateley, which has been already fully described, but in larger quantities, varying, according to circumstances, from an eighth of a grain to one grain, most commonly employing about a sixth for the purpose. He regarded it as a remedy for almost all varieties of stricture, except the mildest, and hesitated to employ any other measures with an 'impassable' obstruction, unless after many trials he failed to get through it. For cases in which there is extreme irritability of the urethra, or where great disposition to contract appears on the cessation of treatment, he recommended the potassa fusa as peculiarly adapted.

Mr. Henry Smith wrote in favour of employing it in some cases as an adjunct to dilatation, but his estimate of its value was lower than that of Mr. Wade, while his method of applying it was the same. He reserved it chiefly for those cases in which he failed to pass any instrument at all; when he applied it to the seat of obstruction, taking great care lest this should be a false passage, as the application to this instead of to the stricture would be a very serious matter, and it is, he states, 'an accident very likely to happen.'[1]

Besides these methods of applying caustic to a stricture there are no others of any importance. All may be resolved into the two following categories. Either a small instrument containing it is introduced into the stricture, which is not then generally a very narrow one, or a small portion of the agent is carried down to it, and pressed against its anterior surface.

In considering the merits of these systems, it will be obvious enough that it is very difficult indeed to obtain the data which are required, in order to enable us to form an opinion of any value respecting them. As we have no means of acquiring an ocular demonstration of the effects of the caustic upon the spot to which it is applied, and as it is confessedly a difficult, nay, almost impossible, thing to indicate accurately that spot before doing so; or afterwards to say positively what extent of application has been made; and as, moreover, its very use involves that of dilatation also, already seen to be an agent of the greatest value in the treatment of stricture, any conclusions drawn from the results of such treatment, unless the opportunity of prosecuting extensive researches for the sake of comparison were afforded, may be exceedingly fallacious.

In default, then, of possessing such data, I long ago made comparative experiments as to the respective actions of the nitrate of silver and caustic potash on tracts of mucous membrane, where the results are easily marked by the eye; and although not perhaps possessing any great value, afford some insight into their mode of action, when applied to parts of the same membrane which are beyond the scope of vision.

The nitrate of silver and the caustic potash are widely different in the intensity of their actions when applied to organised tissues. Let a piece of the solid nitrate be pressed, for twenty or thirty seconds, against a portion of mucous membrane, situated where its effects may be viewed (the inner side of the cheek within an inch of the lip is a good place for the purpose). Immediately on its removal a white impression is seen, caused by the coagulation of the albuminous matters in contact; this, a mere film at first, grows denser and whiter during a period of two or three minutes, and at the lower side the film spreads from the effect of gravitation. The spot becomes slightly elevated above the surrounding surface; no pain is felt. In less than ten minutes it acquires a pale greenish hue, and in an hour or two the elevation is seen to be due to a small quantity of fluid beneath the epithelial layer of the mucous membrane; and slight smarting is felt. In twenty-four hours the sloughy film begins to wear away, and a whitish surface, with a red margin, evidently a small granulating sore, appears beneath. In forty-eight hours the slough has totally disappeared, the sore is smaller and slightly depressed. In seventy-two hours the sore is reduced to a point, there is the same depression, and faint radiating lines converging to the centre mark a degree of contraction around. Traces of these latter appearances are observable on the sixth day after.

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[1] *Stricture of the Urethra.* London, 1857, pp. 129, 134, 154.

The caustic potash was recommended by Mr. Whateley to be used in quantities not exceeding the twelfth of a grain, and it has been frequently remarked by those who have had no experience of its powers, that any results from the application of such minute portions must be wholly inappreciable, and that any good effects from the treatment must be therefore wholly due to the dilatation, which is practised at the same time. This is not necessarily true, as may be learned by making an experiment similar to that pursued with the former agent. Take a piece of fresh and dry caustic potash, and weigh a grain—comparatively a large portion, the specific gravity being light. Break it into fragments, and select one which weighs the twelfth of a grain. Arm a bougie with it, and apply it for thirty seconds to the mucous membrane of the cheek with a fair amount of pressure; an acute burning pain is instantly felt, and on removing the instrument a white spot is seen rather larger than the piece of potash used, and the pain ceases; it gradually becomes black, and in three or four minutes is completely so; and now a little extravasation of blood is seen beneath the epithelium around, while the black spot, increasing its dimensions, has become about the size of a split pea. On examining the bougie, not one-third of the potash is found to be dissolved. An hour after, a greyish slough is seen of the size just indicated, and the mucous membrane surrounding it is swelled and reddened. Twenty-four hours after the slough is rather larger than at last report, is yellowish in colour, and at the centre of it a very small deep hole exists, indicating the point at which the caustic has acted most energetically. The parts around are still somewhat inflamed, and are tender. Forty-eight hours after, the slough remains as before, but more depressed beneath the level of the surrounding surface; inflammation around subsiding. Seventy-two hours, much of the slough has worn away by degrees, and the depression is more marked, a cavity existing about the sixteenth of an inch in depth. The margins are still thickened but not tender. Five days after, the cavity is contracting laterally, but it appears as deep as before, and there is some thickening of the margins. Seven days after, the cavity is reduced in size; the edges are still a little elevated above the surrounding surface. Fourteen days after, the depression is very obvious, as is also the thickening around, although less evident than at last report. I am free to confess that I was not prepared to witness results so active and enduring from the use of a portion of potash, certainly weighing less than the thirty-sixth part of a grain. These observations have been accurately recorded, and in both instances have been tested by a repetition of the experiment.

There is one point on which almost all observers are agreed, viz. that the nitrate of silver has no power to destroy a long and narrow stricture, and if it should be contended that the caustic potash is sufficiently active to accomplish the purpose, I think few would advisedly undertake to afford a practical proof of its powers. There could be no hesitation as to the propriety of characterising such a proceeding as dangerous and inexpedient in the extreme.

In proof of the former assertion, it should not be forgotten that its warmest advocates have not hesitated to record their conviction of its inutility, to say no more, in such cases. Hunter's opinion has been already quoted (p. 136). Home, who used caustic more readily, heroically, and pertinaciously than any man, states that some cases 'require a greater degree of perseverance on the part of the surgeon, and a longer attendance on the part of the patient, for the accomplishment of a cure than are often to be met with.' He then states that twelve cases have come under his notice which have not been removed by the caustic, and refers to a certain chapter in the second volume of his work for a more particular account of those cases in which 'the patients declined perseverance in the mode of treatment;' and he finally 'regrets that we have not a more active caustic,' since 'when the stricture becomes ligamentous, or almost cartilaginous, the lunar caustic makes *less impression upon it than could be imagined from any preconceived opinion on the subject*.'[1]

Can a more complete refutation of the idea that the nitrate of silver is a remedy for the worst forms of stricture be found than in these words? But let us for a moment turn to the cases in which the want of perseverance on the part of the patient was so unfortunate for himself and disappointing to the operator. The history of the last case recorded (of which a long account is given) is summed up by the author with the information, that during six years the caustic was passed 486 times, after which the patient continued free from relapse, but was '*under the necessity of passing a bougie daily, and leaving it in the urethra for half an hour, to keep the canal in a state of tranquillity!*'[2] Other instances of a similar kind are to be found, exemplifying the influence of nitrate of silver upon obstinate strictures, and need not be quoted here. But I cannot resist a reference to the chapter on 'Difficult Strictures cured by Perseverance,' where an illustration is brought forward in the form of a history, which is described as 'a case of stricture requiring twenty-two years for cure.' And in the next chapter follows a case in which the patient placed himself under Sir E. Home's care, in the year 1800, and had the caustic applied 233 times during the subsequent eighteen months. After this he continued under treatment for certain periods during every year until 1815, on the 8th of May in which year a bougie first entered the bladder, the caustic having been applied 1,258 times! These, let it be understood, are from the successful cases.

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[1] *Stricture of the Urethra*, vol. i. p. 524.

[2] *Ibid.* vol. ii. p. 113.

Sir Charles Bell, who also advocated the use of caustic, considered it unfitted for strictures 'above half an inch in length.'

Sir B. Brodie and Mr. Guthrie also enunciated similar views, and rarely used caustics in their practice; the former indeed after acquiring experience strongly opposed the employment of either agent.

During the last twenty years, the use of caustic agents to stricture has gradually but entirely disappeared. It might be said, and with some show of reason, that it was scarcely necessary to devote so much space to a consideration of the subject. After giving full consideration to the question I cannot take that view of it. The present generation is perhaps scarcely aware how widely approved and adopted was the treatment by caustics during the first third of the present century. And were the records which describe that large experience in relation to them which our forefathers had to drop out of sight, nothing is more probable than that their employment would soon again be vaunted, if not actually as a novelty, yet as the praiseworthy revival of a past neglected or insufficiently appreciated method of treatment. This it is to be hoped may never occur, and the best way of preventing it is to maintain, for a time, some impartial sketch of the methods by one who enjoyed the opportunity of observing them in action, and who has endeavoured to report without prejudice respecting them. This is what it has been my aim to accomplish here.

## CHAPTER IX.

### THE TREATMENT OF STRICTURE BY INTERNAL INCISIONS.

We arrive at the third mode of treatment, viz. the division of stricture by means of cutting instruments.

This is accomplished in two methods, each completely distinct from the other: the first by incisions made altogether within the urethra; the second by incisions commencing from without, usually in the perineum, and carried into the urethra, so as to divide all the tissues which form the stricture. The first method, or that of Internal Urethrotomy, will form the subject of this chapter.

**Internal Urethrotomy.**—It is not surprising to find that this method should have been put in practice at an early period in the history of the treatment of stricture, since the propriety of using the knife to overcome an obstinate obstruction must frequently have suggested itself to the mind of the surgeon, foiled in his efforts to remove or dilate it by any kind of bougie.

Thus references to the use of incisions for an occluded or contracted urethra are met with as early as the works of Heliodorus (first century), Galen (second century), and others, as Oribasius (fourth century), Paulus Ægineta, Rhazes (eighth and ninth centuries), to Avicenna (tenth century). Albucasis (twelfth century) describes and gives a drawing of a small knife—a simple pointed blade, slightly curved, with a short handle—adapted only for cutting upon or through the face of a stricture situated in the anterior part of the canal.[1]

The practice of Amatus Lusitanus, Diaz, De Vega, Parè, and others, in the sixteenth and seventeenth centuries, who often combined incisions with the use of escharotics, has been already noticed. Chopart speaks of the section within the urethra as adapted to very rare cases of impermeable obstruction when not situated too far back, and quotes Allies, 'Traité des Maladies de l'Urètre,' Paris, 1755, p. 73, who gives there an account of his having successfully perforated, with a trocar and canula, a stricture which was situated within the glans penis.[2] Dr. Physick, of Philadelphia, employed a lanceted stilette which was protruded from the end of a silver canula, first in 1795, and subsequently, with success, in several cases. His two instruments, one curved, the other straight, are engraved in Dr. Dorsey's 'Elements of Surgery.'[3] John Bell recommends for a case of long and obstinate stricture, complicated with perineal fistulæ, that the obstruction should be perforated by a 'lancet-pointed trocar,' in a canula.[4] Sir Charles Bell devised an instrument for cutting from behind forwards, after it had passed through the stricture (figured and described at page 155).[5] Doerner and Dzondi, in Germany, at the commencement of the present century (1818–1826), used a lancet-shaped knife, sheathed in a tube, to cut from before backwards.

About this time Mr. McGhie, of Dumfries, communicated a paper to the 'Edinburgh Medical and Surgical Journal,' in July 1823, re-commending a method, invented by himself, of passing down a wire to the stricture within a canula previously introduced. The end of the wire was free for the space of one inch to enter the contracted part, above which a small instrument was screwed for the purpose of being pushed through it. Engravings of the apparatus are appended to his paper, which are reproduced at fig. 42.[1]

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[1] *De Chirurgia*, Channing. Oxon, 1778, vol. i. p. 112. Also at pp. 276–7, two catheters are represented as employed in connection with such a proceeding.

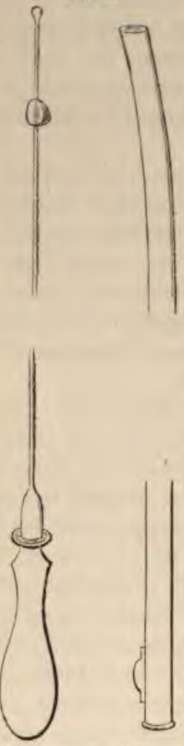
[2] *Traité des Maladies des Voies Urinaires.* Paris, 1821, vol. ii. pp. 327, 328. A posthumous ed.: Chopart died in 1795.

[3] 3rd edition. Philadelphia, 1823, pp. 155, 170, and plate xix.

[4] *Principles of Surgery*, vol. ii. p. 250. London, 1806.

[5] *Oper. Surgery*, vol. i. p. 117. London, 1807.

FIG. 42.



McGhie's canula and urethrotome with a probe-pointed director in front of it to cut from before backwards.

Amussat, of Paris, employed in 1824 an instrument with five or six very shallow blades arranged around a central axis, for the purpose of cutting from before backwards, but to a very slight extent, the tissue of a hard and unresisting stricture, and thus to facilitate the passing of a bougie afterwards. To this proceeding the term of 'scarification' was applied.

Dieffenbach designed a urethrotome much on the same principle as that of Sir Charles Bell in 1826.

In 1827 Mr. Stafford introduced to the notice of the Westminster Medical Society two instruments which he had designed, one for cutting through impermeable obstructions by projecting forward a lancet blade, the other for insuring greater accuracy of division for those through which, though narrow, a sound can be passed. 'In these instances he introduced a small wire through the urethra into the bladder; on this, and with it as a guide, he introduced a hollow tube with an open extremity, to receive the wire, which was slightly curved. This instrument was then passed down to the stricture, and a small lancet was made to project on either side from its extremity, so as to divide the obstruction, being, however, retained by means of the wire in the proper canal.'[2] This was a very important advance in the progress of urethrotomy. The apparatus complete, with the lancets directed by the guide or wire, is shown at fig. 43, on the opposite page.

Afterwards, in the year 1836, Mr. Stafford published a small work, in which he added the description of a third instrument for the purpose of cutting from behind forwards, while in the act of withdrawal through the stricture. Subsequently he improved his original instruments and invented fresh modifications, which have had an important influence on those which have subsequently appeared. It is represented at fig. 44.[1]

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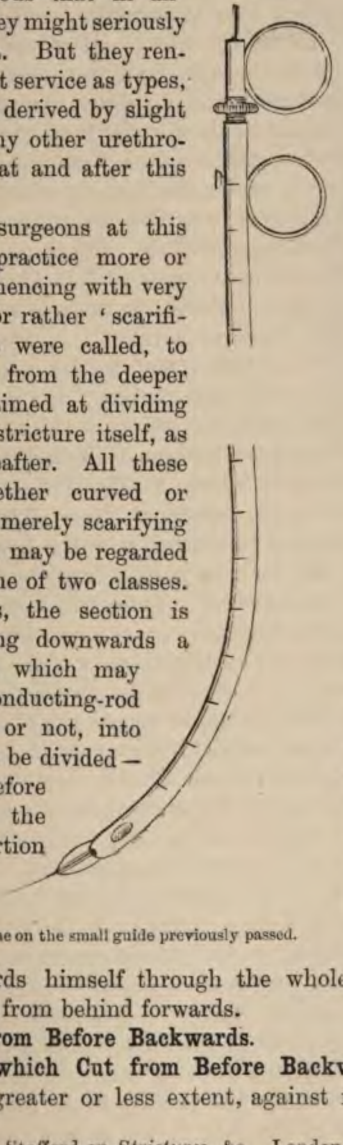
[1] Vol. xix. 1823, p. 361 *et seq.*

[2] Report of Medical Society of Westminster.—*Lancet*, December 8, 1827, vol. xiii.

Nevertheless, Stafford's instruments were never much employed in this country, tending rather to confirm the prejudice which long existed against internal urethrotomy, since it was obvious that in unpractised hands they might seriously injure the urethra. But they rendered an important service as types, from which were derived by slight modifications many other urethrotomes, produced at and after this period.

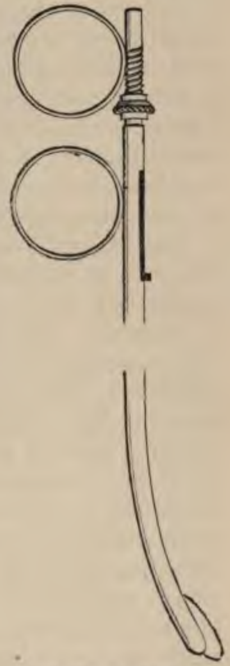
The French surgeons at this time pursued a practice more or less similar, commencing with very slight incisions, or rather 'scarifications,' as these were called, to distinguish them from the deeper incisions which aimed at dividing the tissue of the stricture itself, as we shall see hereafter. All these instruments, whether curved or straight, whether merely scarifying or cutting deeply, may be regarded as belonging to one of two classes. In the first class, the section is made by pushing downwards a lancet-like blade, which may have a slender conducting-rod in advance of it or not, into the obstruction to be divided—Incision from before backwards. In the second class, a portion of the instrument containing a small blade sheathed, having been first carried through the stricture, divides it by protruding the blade, the operator drawing it towards himself through the whole of the contracted portion—Incision from behind forwards.

FIG. 43.



Stafford's urethrotome on the small guide previously passed.

FIG. 44.



Stafford's urethrotome to cut from behind forwards.

*A*. **Incision from Before Backwards.**

**Instruments which Cut from Before Backwards.**—An objection which lies, to a greater or less extent, against most of these instruments, especially the earlier forms of them, is, that the operator has not the means of judging easily how far, or what he cuts. Thus the attempt to perforate an obstruction, otherwise impassable, by pushing a pointed blade into it without a guide, must be always hazardous; extremely so, if it be attempted in the curved part of the urethra, for, however cautious the operator may be, the blade may be most readily pushed out of the urethra into surrounding structures, and infinite mischief may result. Hence the use of all curved instruments constructed on this principle is now universally renounced. Less dangerous is it to lay open the perineum and divide the stricture from without, thus giving free vent to all fluids whether from the bladder or from a wound, than to incise at hazard the urethra from within, when operating at a distance from the external meatus, and probably make a channel for these matters into the erectile cavities and other structures around.

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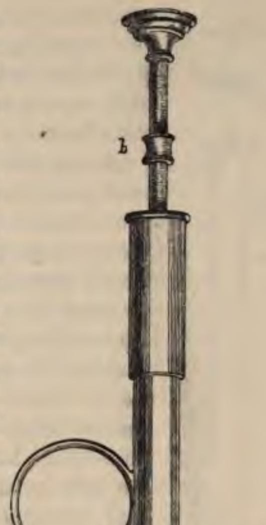
[1] Stafford on *Strictures*, &c. London, 1836.

For the section of contractions of the urethra, situated in the moveable part of the penis, an instrument of this kind may perhaps be applied from within, to remedy those rare cases in which such division is indicated. Generally, however narrow it may be, some dilatation can be accomplished, or an instrument with a slender guide can be introduced, which is the only safe method; and no means therefore should be left untried to effect this object. If, however, the operator fails after repeated attempts, an incision of limited extent may be made on its face or anterior part, which, as Mr. Guthrie has remarked, is that which offers the greatest resistance, especially if there have been much previous instrumental treatment, with the hope and expectation that a small catheter may then be passed, in which case the operation may be completed by means of an instrument which cuts from behind forwards, or by dilatation alone, as circumstances dictate. Little can be said in favour of adopting any such method, or of the chances of success which it affords, so great is the uncertainty in cutting without a guide of any kind. Hence no effort should be spared to pass fairly through the obstruction some probe or bougie, however small, in order to furnish a route for the cutting instrument, if such an one be required. In case of the attempt failing, the following instrument, which I designed many years ago, is so constructed as to prevent all possibility of the blade leaving the urethra, however it may be used. (See figs. 45–6.)

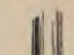
There is a guide, *a*, which projects beyond the canula, of which, however, it forms a part, having a slit in it, through which the blade moves. This extremity of the instrument should constitute a separate portion, and screw firmly upon the canula. It should be formed of steel, and not of silver like the rest of the canula, because in the latter case it cannot be made so small as a No. 1 or 2 catheter without being unduly flexible, and thus becoming liable to bend so much in use as to interfere with the free passage of the blade through it. In steel it can be made of the size of No. 2, tapering to No. 1 at the point. The extent to which the blade protrudes forward is regulated by a nut, *b*, which screws on the handle: this arrangement being previously made according to the discretion of the operator, the guide is passed through the obstruction, and pressure is made on the handle, which forces the blade from the canula to the required distance, and causes it to cut in depth about one-eighth of an inch on either side of the guide. It retreats into the canula by means of a spring in the handle when the pressure is removed. Before making the incision, however, the strictured part should be steadied by the finger and thumb of the left hand, that the parts may be closely applied to the cutting instrument, and not be pushed away instead of being divided by the protruding blade. If the incision thus made be insufficient, an instrument which cuts from behind forwards may now be introduced through the contracted portion and the necessary division effected.

FIG. 45.



Cutting instrument with central guide; *a*, the guide; *b*, nut on the handle which regulates the distance to which the blade protrudes; *c*, the blade; *d*, side view of the same, the steel end, detached, showing the slit.

FIG. 46.



Similar instrument for cutting laterally; *a*, the guide; *c*, the blade.

There is also a modification of this instrument (fig. 46), for the purpose of cutting on one side of the urethra only.[1] Nearly twenty years ago I improved it by making the terminal director slender, curved, and hollow as a catheter, and the channel continuous throughout the instrument, with a small stop-cock at the end, so that urine may be drawn off through it, and the safe position of the instrument in the bladder verified. The projecting part is made to rest firmly against the obstruction, when, by pressing the handle, the blade divides it. Another addition is that by means of a simple arrangement, which need not be described, the blade may also be made more or less salient at the will of the operator. (Fig. 47.) The recent 'improvements' (see next page) of Maisonneuve's urethrotome, in which the blade is covered with a sheath, are really only reproductions of this instrument, which has the advantage of being a catheter also.

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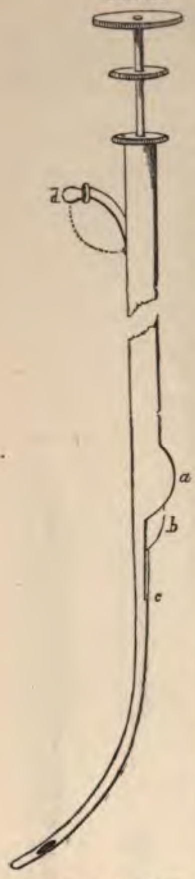
[1] Vide *Lancet*, Jan. 12, 1856.

FIG. 47.



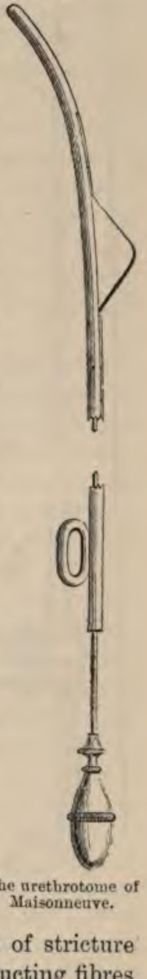
Instrument with hollow guide, to incise from before backwards. *a*, the bulb, which rests against the face of the stricture. The part below this is the size of No. 3 catheter; *b*, the blade partly exposed; *c*, the extent to which the blade can be pushed. Just below this point the curve commences; *d*, the exit for urine, which flows through this instrument as through a catheter. By means of the second ring on the handle, the blade can be rendered more or less salient, and also be pushed along the groove. Figured in edition of 1869.

I may add here that for many years I have not used or advised the use of any instrument which cuts in this direction, and merely include these here as a part of the historical sketch, as well as for the purpose of showing a suitable instrument for those who meet with conditions in which such a proceeding may appear to be the only one practicable. In any case, strictures requiring treatment without a guide previously passed into the bladder must be extremely rare; and if incision from before backwards is to be practised at all, it can only be applicable to those narrow and obstinate contractions which affect the antescrotal urethra, and then only or chiefly for the purpose of making way for another instrument or guide, so that the complete incision shall follow, probably in the direction from behind forwards. These are generally found between 2½ and 3½ inches from the meatus, and are usually formed of a ring of indurated tissue, which is remarkably undilatable. For their treatment, an internal section is almost always necessary.

These antescrotal strictures may be sometimes divided by means of the instrument for incising contraction of the external meatus, or by others hereafter to be described. Whatever be the method adopted, a catheter is to be passed after the operation into the bladder, the size being not less than No. 9 or 10, and retained there forty-eight hours, while the patient remains in bed.

But when a guide, however small, can be passed through the urethra into the bladder, other methods of performing urethrotomy from before backwards can be adopted. This was thoroughly understood by Stafford, long ago, as we have already seen. The modern type of the operation is that in which the urethrotome of Maisonneuve is employed. It has been modified by different makers, and at the suggestion of different surgeons, but the principle on which the section is made is almost identical in all the varieties which have sprung from the original instrument; moreover, it enjoys still considerable popularity on the Continent. It consists of a slender guide or conductor in steel, the size and nearly the form of a No. 1 or 2 catheter, but grooved throughout its course. This is first introduced through the stricture into the bladder. Along this groove slides a blade of triangular form, the base of the triangle being attached to a long steel wire stylet, while the two other sides of the triangle project considerably. This blade can be pushed, by means of a handle attached to the wire, through the whole course of the urethra. (See fig. 48.) The apex of the triangle, which is the salient part, is blunt, and the lower side of the triangle only is sharp and will cut. In the act of passing the blade, the healthy part of the urethra is protected from incision by the blunting of the apex (like the button of a foil in fencing), while the sharp side divides certain of the hardened tissues which it meets. Improvements have been made on Maisonneuve's instrument by Sedillot, also by Voillemier, of Paris, and by Gouley, of New York; the two former furnishing the blade with a permanent or fixed sheath or guard; the last named making the shaft hollow, and sliding it over a long slender whalebone conductor previously passed into the bladder, on the principle before described. (See p. 112.) My friend Mr. B. Hill, of University College Hospital, has devised a modification of the original instrument, by adopting the sheathed blade, and letting it slide between two very slender rods previously passed through the stricture. (Fig. 49, page 152.)

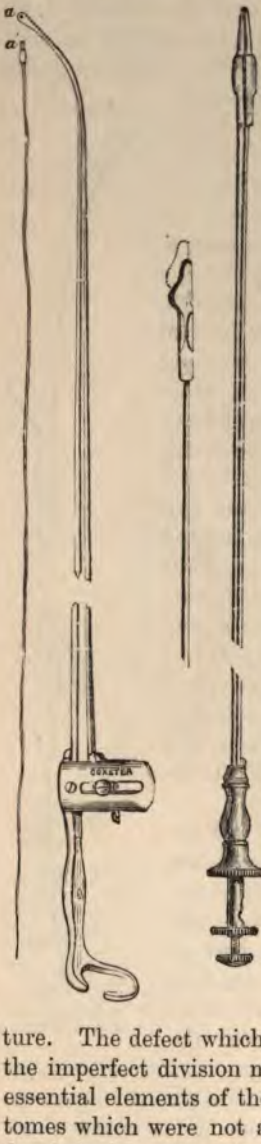
FIG. 48.



The urethrotome of Maisonneuve.

There is an objection which lies against all the urethrotomes constructed on the system of Maisonneuve which is simple and obvious, and which must be regarded as fatal in respect of their efficiency for cases of confirmed and indurated stricture, such, indeed, as constitutes that form of the disease which most requires treatment by incision. It is an axiom accepted by most, if not by all, who have carefully observed the results of urethrotomy by any method, that if an incision of stricture is required at all, it is essential that the whole of the obstructing fibres should be divided. No one laid more stress on this doctrine than Syme of Edinburgh, after he had had a considerable experience of his method by external division. The cases of relapse after that operation, he had no doubt, were chiefly those in which he had cut insufficiently and left a few fibres undivided. The justice of this observation has been repeatedly verified by many surgeons, including myself, with internal urethrotomy. And this is what happens with Maisonneuve's instrument: the blunt apex, which enables the blade to pass without injuring the healthy urethra, fails to cut the most elastic or yielding fibres of the stricture, which, by reason of their yielding character, permit the blade to pass through by stretching them. The blade incises, no doubt, the strongly marked or narrowest portion of the stricture, but all the obstructing tissue is not divided, especially that for some distance before and behind the maximum point of narrowing, and these uncut fibres will at no distant period of time show their presence and reproduce contraction. Again, the whole stricture is in some cases pushed onwards to a considerable distance by the blade, and is apt to escape section; an occurrence which is prone to vitiate the action of all instruments cutting from before backwards. Further, by no manner of using the instrument can its power or mode of cutting be controlled or regulated. It is a mechanical apparatus or machine, which accomplishes a certain amount of action and always in one way, whatever the case requires, and no more. This constitutes a serious ground of objection to any urethrotome.

FIG. 49.



Resuming briefly the history of the operation, it may be said that the earlier forms of internal urethrotomy in Paris were all the product of very cautious experiment in relation to the depth and extent of the incisions necessary in the treatment of stricture. The defect which attached to most of them at first, consisted in the imperfect division made of the contractile tissue, constituting the essential elements of the stricture, and in the employment of urethrotomes which were not adapted to insure a free incision. The fear of deeply incising the structures surrounding the urethra, and so occasioning free and dangerous hæmorrhage from the erectile tissue, as well as other evils, led to the use of small blades, and even to the making numerous slight scarifications of the urethra at the seat of the stricture, in place of what alone could render lasting service, viz. complete division of all the obstructing fibres. Temporary relief was thus afforded, but the narrowing very soon reappeared. Civiale, indeed, with excess of caution, sometimes employed to the last what he called a 'scarification légère' in aid of dilatation; and was in the habit, while avowedly treating a patient by the latter method, to help the bougie at any time when the process proceeded slowly, by making with his urethrotome a little incision from which a drop or two of blood appeared, and then passing the bougie with increased facility; a process repeated several times perhaps in the course of treatment. For patients living near to him such cautious and safe management no doubt attained valuable results, especially for advanced cases in which the operator desired to avoid a bolder course; and it saved him and them much anxiety. For patients who came from a long distance, and who after a month or two went away charmed with the extent of their relief, and the ease with which it had been effected, a severe disillusion sometimes arrived. Nevertheless, such practice is not without its lessons, and is not to be lost sight of in its applicability to an occasional case now.

Mr. Durham of Guy's Hospital proposed a few years ago the plan of making several limited incisions in a stricture simultaneously, by sliding over a guide, previously passed into the bladder, a tube with a conical bulb in the end of it. This bulb contained four narrow blades, which, when protruded therefrom, would incise at right angles the tissues encountered, thus making a section like this +, provided that every blade cut equally with the rest.[1] There is no pretension with this instrument to make division of all the stricture-tissue; on the contrary, the object is to relieve the narrowing *pro tanto*, and enable a catheter to follow into the bladder over the guide when the cutting instrument is withdrawn. The proceeding ranks rather with scarification than with complete urethrotomy, as here understood. I may add that Mr. Coxeter made for me an instrument on this principle nearly thirty years ago, which I have now, but with this difference, that it had six blades instead of four; and I gave it up after a trial or two, never making it public, as I gradually learned what appeared to me to be the need for complete division of the whole of the indurated structures forming the stricture, and subsequently employed only instruments by which that object could be attained. Amussat's instrument alluded to (page 146) was similarly constructed, but appears not to have been covered with a sheath, and it was preceded only by a short guide with a little knob at the end.

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[1] *British Medical Journal*, March 16, 1878: 'On Internal Urethrotomy by Aid of a New Urethrotome.' By Arthur E. Durham, F.R.C.S. Surgeon to Guy's Hospital, &c.

### *B.* Incision from Behind Forwards.

**Instruments to Cut from Behind Forwards.**—In this class of instruments, viz. those which, being first passed through a stricture, are made to cut in the act of withdrawal, a larger variety is presented for our notice. It was not until after the employment of some of the earlier instruments of the type just considered that urethrotomes designed to cut in the act of withdrawal, after having passed beyond the stricture, were employed. This class comprehends both urethrotomes and scarificators; instruments for long incisions and short ones, for single and multiple incisions; instruments fitted with apparatus for rendering the urethra tense and immovable at the moment when the blade penetrates, so as to insure a sufficient section; some in which the blade moves freely in the sheath of the instrument, and others in which the instrument itself must be drawn outwards in order to make the incision. Some are straight, others curved; some have flexible points, others are entirely rigid. Some are provided with a bulbous extremity, within which the blade usually lies concealed, so that it may be used as a bulbous sound, for the purpose of indicating the position of the stricture, the utility of which is not to be doubted.

The principle of action involved in the section by withdrawal of the instrument certainly offers a security to the operator that he is cutting strictly in the line of the urethra. There is one drawback, however, namely, that it is a necessary preliminary to their employment that the stricture should be, or should be rendered, capable of admitting an instrument of the calibre of No. 3 or 4 (English); otherwise, of course, the urethrotome cannot be passed through it. For most strictures, therefore, some antecedent dilatation is necessary. The objection, however, is more apparent than real. It is not to be forgotten that the indication for a cutting operation *is not the small calibre of the contraction, but its non-dilatability.* A stricture may be extremely narrow, may not admit even a No. 1 bougie at the commencement of our treatment, but may nevertheless be easily and quickly dilated to the natural size. On the other hand, it is no less certain that a stricture may habitually admit a No. 4 or 5 bougie, yet it may be productive of grave symptoms, and may be not at all, or but very slightly, amenable to dilatation, however carefully and perseveringly employed. Such especially are the cases, exceptional it is true, which require division by one means or another.

Sir Charles Bell was perhaps one of the very first to remark the superiority of a section carried from behind forwards through a stricture, over any incision from before backwards upon its face. He designed an instrument very early in the present century (year of publication being 1807) expressly for this purpose, writing of it as follows:

'When we try to push a stilette down upon a stricture the chance is equal at least that we pass from the tract of the canal into the body of the penis. We must therefore contrive to cut the stricture as we withdraw the instrument, having previously ascertained that it was in the canal. The instrument is introduced down to the stricture; then the probe point A is pushed onward through the callous part of the canal. In this movement it does not cut. It may enter with difficulty, but this is the only difficulty in the operation. It is then withdrawn; and as it is withdrawn, it cuts and notches the whole length of the stricture. You then introduce a bougie of a size to distend the passage fully. Here there is an immediate enlargement of the canal. In six hours, the bougie being withdrawn, the urine is passed in a full stream; but we must persevere in the use of the bougie.'[1] (Figs. 50 and 51.)

We now pass to a much later date for the next marked attempts to proceed farther in the foregoing direction. In France, among the earliest forms of instrument were those of Leroy D'Etiolles (1825); an illustration of his design for making an incision from behind forwards is shown at figs. 52, 53. These were followed by the urethrotomes of Tanchon (1835), Ricord (1838), Mercier (1843), and Civiale (1849), among several others. Later, those of Sedillot, Bonnet, Trèlat, Reybard, Boinet, and Charrière, some of which are referred to in their places.

FIG. 50.

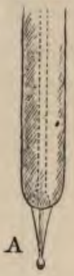

FIG. 51.

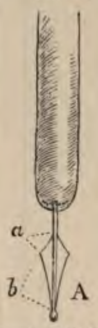

FIG. 50.—A. Bell's urethrotome for cutting from behind forwards. The instrument ready to be passed down to the stricture.

FIG. 51.—A. The instrument with the tapering arrow-head pressed through the stricture which it was to incise by withdrawing; *a*, the cutting edge; *b*, the blunt edge.

Civiale's original model may be seen at fig. 54, and was designed solely with the object of cutting from behind forwards, and using the bulb for verifying the situation and extent. of the obstruction. Charrière, the late well-known instrument maker, devised a modification so as to employ it in two ways, from behind and forwards, and from before backwards also. (Fig. 55.)

Trèlat's urethrotome may be named here: it was contrived to cut through a narrow stricture from before backwards, and then to complete the operation by making a deeper incision on withdrawal from behind forwards. (See fig. 56.) It is also represented here because, like the preceding, it enjoyed a certain celebrity, and not for the purpose of commending the principle on which it acts.

The first perhaps among the French urethrotomists who really perceived the necessity for complete division, or at least was bold enough to avow and to act upon his belief, was Reybard, whose work gained for him the award, by the Imperial Academy of Medicine, of the

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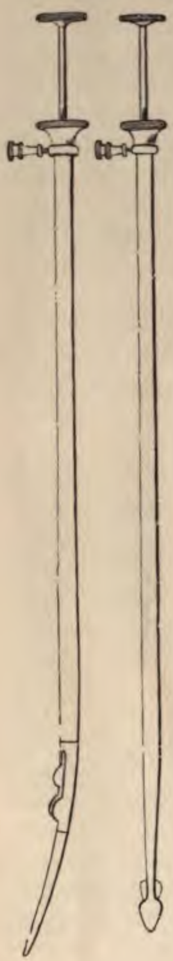
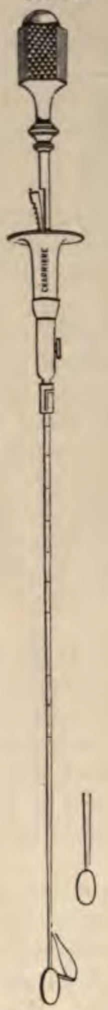
[1] *A System of Operative Surgery*, by Charles Bell. London, 1807, vol. i. pp. 117–18. The above cuts are copied from that drawn by Bell himself for his work.

Fig. 52. Fig. 53.



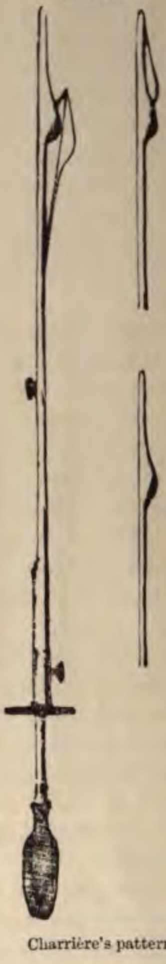
Scarificators: from Leroy D'Etiolles on Stricture.

Fig. 54.



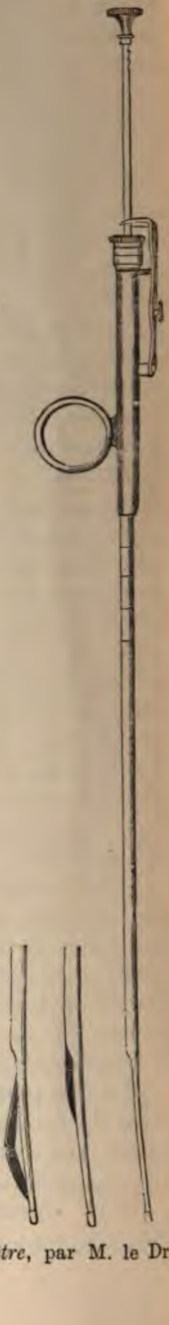
Civiale's original urethrotome.

Fig. 55.



Charrière's pattern.

Fig. 56.



Argenteuil prize in the year 1852.[1] He repudiated cauterisation altogether as a means of treatment, and regarded dilatation as generally insufficient, preferring internal urethrotomy in the majority of cases. He employed a powerful urethrotome with a long blade, made considerable dilatation of the urethra first, so as to permit the introduction of a stout instrument, at least No. 18 in size, flanked by two lateral rods, which were then to be separated by means of a screw in order to stretch the passage as much as possible. Then, the urethra being in this tense condition, the blade was drawn outwards, commencing an inch beyond the stricture, which was unflinchingly divided throughout its whole extent, often involving an incision two or three inches in length, and half an inch or more in depth. (See fig. 57.) The subsequent treatment consisted in passing a full-sized bougie or some special dilating instrument, daily, on not less than thirty or forty consecutive days, in order to maintain apart the borders of the wound in the urethra, to prevent union by the first intention, and insure the production of granulations, which shall afterwards constitute a long 'intermediate cicatrix,' and thus, by the formation of a piece let into the side of the urethra, as it were, produce a permanently enlarged canal. This mode he believed would really produce a permanent cure of stricture.

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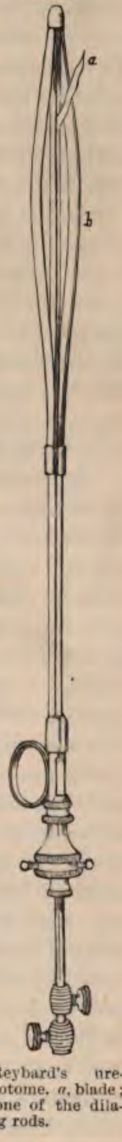
[1] *Traité Pratique des Rétrécissements du Canal de l'Urètre*, par M. le Dr.

His principle was undoubtedly a sound one, whatever may be thought of the practice which he derived from it; but his urethrotome was a dangerous instrument, since it was a purely mechanical one, and could not be influenced by the operator's intelligence. It was not possible to modify the incision, while making it, according to the amount or degree of the obstruction encountered—a power which it is always essential, in my opinion, to possess while making any incision. Moreover, he appears to have been somewhat reckless in using it; and soon meeting with some alarming hæmorrhage, and with consecutive abscesses, and partly from want of experience in the subsequent management of his cases, several died, and his method fell into disrepute. A method differing little from that of Reybard, and therefore named here, was adopted a few years ago by Dr. Otis of New York. The characteristic of his doctrine and treatment has been the high estimate he takes of the calibre of the urethra (see page 5), and the consequent use of large instruments in treating stricture, as compared with those of his immediate predecessors and contemporaries. Long ago, however,

FIG. 57.



Reybard's urethrotome. *a*, blade; *b*, one of the dilating rods.

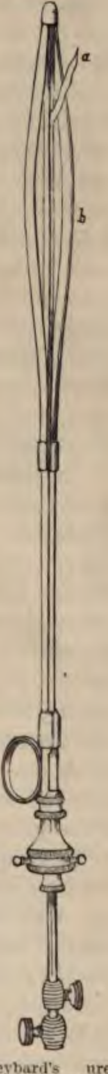
Reybard, ouvrage couronné par l'Académie Impériale de Médecine, qui lui a décerné, en 1852, le grand prix d'Argenteuil. Paris, 1843, p. 205.

these large instruments were somewhat heroically used by Boyer and by Mayor of Lausanne, and with results which led to a natural reaction in favour of small ones. Hence probably the urethra came to be under-estimated in regard of its capacity for being stretched, and Dr. Otis has called attention to the fact with a certain advantage. In connection, however, with what I cannot but regard as a return to extreme views, it is the more necessary now to recall attention to the fact that the urethra is a very delicate and sensitive passage, never to be stretched beyond certain limits without incurring risks which are sometimes very grave.

It was about the time of the award to Reybard that I commenced a careful study of the various modes of treatment adopted for the most intractable forms of stricture. I pursued it at length under Professor Syme of Edinburgh, who afforded me every facility for the purpose, in the year 1852, and subsequently with increasing interest at the chief hospitals of Europe during several following years. I slowly acquired definite opinions regarding this difficult and important topic, deciding about twenty years ago on a plan which I have pursued with satisfaction ever since.

Regarding at first with favour Syme's external urethrotomy, owing to its thoroughness, I subsequently learned that the same result might be obtained by a less hazardous operation by means of internal urethrotomy. Syme had long insisted, as Reybard did after him, that in dealing with stricture by operation, free incision of all the opposing structures must be adopted, or the result will be temporary only and disappointing. Syme believed that this could only be effectively realised in practice by an operation performed in the perineum, a proceeding which met with great opposition in many quarters. But there was a cardinal defect in his method, inasmuch as it permitted him to divide one stricture only, since it was rarely possible to reach or deal with two from the limited perineal opening. For Syme was indisposed to recognise the existence of multiple stricture, or, doing so, believed in the disappearance of other or minor contractions after the principal stricture had been freely divided. There is no warrant, however, for any such belief; it will not suffice for the purpose of affording substantial and fairly enduring relief to a patient, whose urethra is narrowed by strictures in two or three distinct situations, to divide, however freely, only the chief of these, and leave the rest untouched. So far from a secondary narrowing disappearing after what has sometimes been termed 'the master stricture' has been cut, it often happens at no distant period that the points formerly slightly affected seem to assert themselves more obstinately than before. It has even been stated that the division of a narrow stricture at or near the external meatus has caused the disappearance of a previously existing narrowing in the bulb. This is contrary to all my experience. I must observe that there is made considerable dilatation of the urethra first, so as to permit the introduction of a stout instrument, at least No. 18 in size, flanked by two lateral rods, which were then to be separated by means of a screw in order to stretch the passage as much as possible. Then, the urethra being in this tense condition, the blade was drawn outwards, commencing an inch beyond the stricture, which was unflinchingly divided throughout its whole extent, often involving an incision two or three inches in length, and half an inch or more in depth. (See fig. 57.) The subsequent treatment consisted in passing a full-sized bougie or some special dilating instrument, daily, on not less than thirty or forty consecutive days, in order to maintain apart the borders of the wound in the urethra, to prevent union by the first intention, and insure the production of granulations, which shall afterwards constitute a long 'intermediate cicatrix,' and thus, by the formation of a piece let into the side of the urethra, as it were, produce a permanently enlarged canal. This mode he believed would really produce a permanent cure of stricture.

FIG. 57.



Reybard's urethrotome. *a*, blade; *b*, one of the dilating rods.

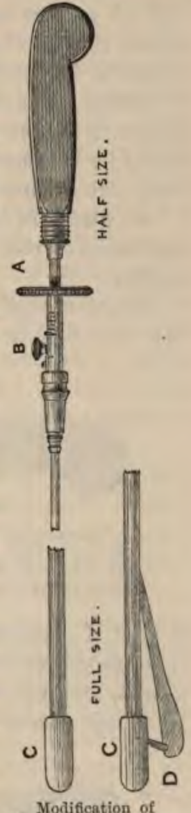
His principle was undoubtedly a sound one, whatever may be thought of the practice which he derived from it; but his urethrotome was a dangerous instrument, since it was a purely mechanical one, and could not be influenced by the operator's intelligence. It was not possible to modify the incision, while making it, according to the amount or degree of the obstruction encountered—a power which it is always essential, in my opinion, to possess while making any incision. Moreover, he appears to have been somewhat reckless in using it; and soon meeting with some alarming hæmorrhage, and with consecutive abscesses, and partly from want of experience in the subsequent management of his cases, several died, and his method fell into disrepute. A method differing little from that of Reybard, and therefore named here, was adopted a few years ago by Dr. Otis of New York. The characteristic of his doctrine and treatment has been the high estimate he takes of the calibre of the urethra (see page 5), and the consequent use of large instruments in treating stricture, as compared with those of his immediate predecessors and contemporaries. Long ago, however,

Reybard, ouvrage couronné par l'Académie Impériale de Médecine, qui lui a décerné, en 1852, le grand prix d'Argenteuil. Paris, 1843, p. 205.

incise enough to permit the introduction of a fair-sized catheter through the urethra when the cutting instrument is withdrawn? For example, we may introduce a small grooved staff along the urethra into the bladder, and then slide along the directing groove a blade more or less protected, as in that of Maisonneuve before described, so as to divide the tissues which lie within range of its point or edge; and thus the operation is very easily and very speedily performed. But complete division, indeed, is rarely thus accomplished; some fibres generally escape the blade; the result in any case is less perfect and effective than that which follows a section made by a knife which is directed by the will of the surgeon, and manipulated according to the amount of resistance encountered at the time, and to the extent of obstruction previously ascertained by exploration. Certainly a keen blade of appropriate form, and completely under the control of his hand, would be always employed by a surgeon for use in any other part of the body than the urethra when he desires to make an incision, the limits of which are to be carefully defined. Why, then, should that spot alone be excepted from the action of this principle? For example, in dividing the bands which confine a hernial protrusion of bowel, the finger and the blade act in perfect harmony; the section depending entirely on the delicate perceptions of the former, which determine the surgeon's judgment during every moment of the cutting act. The section in tenotomy is perhaps a still more apposite illustration of the necessity that exists for an intelligently made division of every fibre which opposes the return of the limb to its natural position. In both instances section is made from the sense of touch only and without the aid of vision, and a like control should govern the act of dividing those bands which encompass the urethra and form the stricture. No mode of section is half so certain, so safe, and so satisfactory as that of drawing through them, from within outwards, a little blade attached firmly to a long slender handle, a proceeding completely under the control of the surgeon's hand. On the other hand, it is said that the cutting blade sliding in a groove (of which Maisonneuve's instrument is the type) is so simple and safe a proceeding, that any man, however unpractised, may perform it. Is that a reason in its favour? Are we to accept an unsatisfactory proceeding because of its universal applicability, and thus be content to establish an imperfect standard for the sake of bringing it within the reach of incompetent operators? Between the two systems now under consideration there is this difference: one is the product of a machine, the other is the handicraft of an artist. And the same distinction which is so obvious in regard of innumerable forms of human activity, between the uniform and commonplace results of machinery and the finished achievements of the intelligent, painstaking artist, marks the character of the two modes of operating now in question. A cultivated hand is the most cunning and effective source of power, and the simpler the instrument employed, the greater is the influence of that hand, and of the intelligence which guides and permeates it.

The urethrotome which I employ, although made on the principle of that long used by Civiale, has been more than once materially modified by myself. The terminal bulb, which has a maximum diameter of No. 5 (English), may be either ovoid in its form or conical; the stem is about No. 2½ or 3. The modified instrument is represented at fig. 58. The blade lies concealed in the extremity, from which, by means of a simple contrivance in the upper end of the sheath or canula, it can be made to project one, two, three, or four degrees, according to the depth of the incision intended. If the stricture is very narrow, two or three days of continuous dilatation with a No. 1 or No. 2 gum catheter are probably necessary to dilate the passage to about No. 4 or 5. The surgeon will then proceed as follows:

Fig. 58.



Modification of Civiale's urethrotome; ovoid bulb.

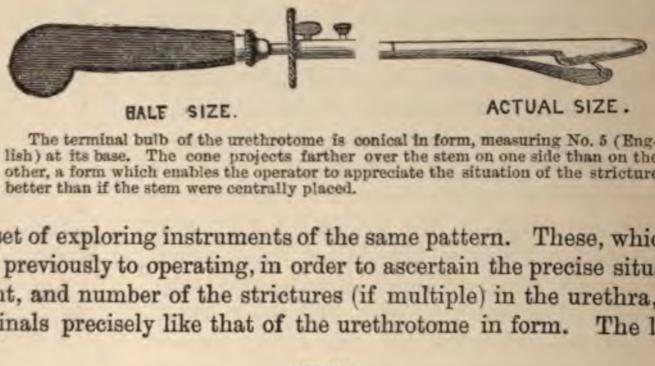
The patient being under the influence of an anæsthetic, the little catheter which has been tied in is withdrawn, and the situation of the chief and other points of stricture before examined may be verified by the urethrotome itself. The urethrotome is first introduced as far as to the deep-seated stricture, through which the terminal bulb is then insinuated. It must now be passed fully half or three-quarters of an inch farther in, that is beyond the stricture, and the blade, being exposed in a direction towards the floor, is pressed firmly thereon and drawn forward until resistance, sometimes considerable, is perceived; the movement then continues steadily outwards until that resistance is completely overcome. A touch on the button near the handle sheathes the blade, and the outward movement proceeds until the site of any second stricture is reached, when another incision is made in the same manner as before. The urethrotome is then withdrawn, and the meatus freely divided, if that should be necessary, as often happens, by a scalpel or by a short urethrotome adapted for the purpose. I next take a blunt metal bougie or dilator, No. 15 or 16 in size, or a bulbous instrument of that number, and ascertain if it will pass without obstruction into the bladder. It generally does so at once; if, however, its progress is arrested at any point, the situation of this is carefully noted, when I withdraw the dilator, reintroduce the original urethrotome, and divide the opposing tissue. But this is not always necessary. The surgeon should rarely be satisfied with anything less than the ability to pass easily after the operation a metallic sound, No. 16 in size; in some cases No. 17 or even 18 will pass. A gum-elastic catheter, No. 12 or 13, is then tied in, and should remain always 48 hours, with an extra 24 or 48 hours if the incisions have been deeper than usual, or if hæmorrhage is free or continuous, the latter being a very exceptional occurrence.

Then, the bladder being emptied, the inlying catheter is withdrawn, and the patient has a hot hip-bath. He will be astonished at the size of the stream when he passes water for the first time subsequently. Of course he remains in his room about two days, and then commences to go out. Meantime a large olivary flexible bougie, or a conical metal dilator, is passed every third day for a few times, then once a week, and finally he is taught to use them himself, and should probably do so once every two or three weeks, and once a month or so afterwards.

An attack of fever occasionally, but not often, follows the operation and requires rest and watching: it very rarely gives any occasion for anxiety.

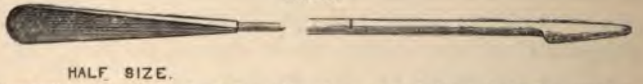
I have recently designed another pattern, employing a urethrotome with a conical or sugar-loaf terminal (fig. 59), and in connection with it a set of exploring instruments of the same pattern. These, which are used previously to operating, in order to ascertain the precise situation, extent, and number of the strictures (if multiple) in the urethra, have terminals precisely like that of the urethrotome in form. The length of the stem—that is, the distance between the handle and the base of the cone-shaped terminal—is six inches, and corresponds exactly with that of the stem of the urethrotome, and it is shown in inches on each instrument by graduation on the stem. (See fig. 60.)

Fig. 59



The terminal bulb of the urethrotome is conical in form, measuring No. 5 (English) at its base. The cone projects farther over the stem on one side than on the other, a form which enables the operator to appreciate the situation of the stricture better than if the stem were centrally placed.

Fig. 60.



The bulbous sounds, employed in various sizes, are made in precisely the same form.

This exact correspondence in length and form is very useful in practice, and whether we use an ovoid or a conical-ended urethrotome, a matter of very little consequence, a set of bulbous exploring sounds should be adopted which correspond, in the manner described, with the cutting instrument. A set complete, for all practical purposes, may consist of ten in number; to use the English scale, say of Nos. 2, 3, 4, 5½, 7, 8½, 10, 11½, 13, and 15. The best time to use them is while the patient is under the influence of ether, immediately after withdrawing the small inlying catheter, supposing one to have been employed, and before commencing to operate. In these circumstances the external meatus is first examined, and is often found to be a little contracted; a bulb, say No. 11 or 12 in size, passes tightly through it, and stops, perhaps at two inches from the orifice. After the use of three or four smaller sizes, a No. 7 perhaps passes that point, and may be supposed to meet a check at five inches, and here, after another trial, a No. 5 may go on into the bladder. Before withdrawing the instrument, the surgeon may trace with his finger the course of the urethra in the perineum, beneath the scrotum forwards, and learn what amount of thickening exists around the canal. He can frequently thus detect the presence of deposit, as a nodule marking each seat of stricture, as if a ring of some material more or less encircled the canal; and on withdrawing the bulbous instrument the situation of the contracted parts is again verified by the check which the bulb receives in passing them in its progress outwards. It is clear, therefore, in such a case, that there are at least two chief points requiring incision besides the orifice.

It is sometimes objected that if a small instrument can be easily passed through the stricture, and if this can be sufficiently dilated to admit a urethrotome as large as No. 5, why should any cutting operation be performed? The answer is briefly this. The chief object of division is to protect the patient against the speedy reappearance of an obstruction; to remedy the tendency to recontract, which certain strictures exhibit, and which almost all do when they have continued several years. The lumen of a stricture may be very small, but this fact alone is not the motive for a cutting operation. Any stricture, however narrow, may be dilated to almost any calibre desired by tying in a succession of flexible gum catheters. *It is the tendency to narrow rapidly after any dilatation* which determines our advice to the patient to submit to urethrotomy. In other words, it is marked contractility in a stricture, and not mere narrowness, which renders operation by incision desirable.

An important inquiry remains—What are the results of internal urethrotomy in relation to the reappearance of stricture? Does the operation free the subject of it from that liability to return which constitutes the very serious character of the disease when treated only by dilatation?

The reply to this question cannot be a simple and categorical one; it must be made with limitations.

I may remark, first, that it may be taken for granted, as already intimated, that no mode of urethrotomy which fails to insure complete division of the obstructing tissues has a chance of affording permanent immunity from the complaint. Whatever be the mode of operating, whether by a machine which is uncertain, or by the inadequate use of any form of urethrotome, however perfect—if incomplete division only is effected, the patient will find his urethra narrowing after a more or less prolonged interval of time.

What happens then in those cases in which, as far as the operator can judge, he has effected a complete division?

I do not hesitate to state that my experience does not warrant me in saying that it is possible to promise immunity from return. We may often regard the period of return as remote; we may produce a condition of urethra which is easily maintained by occasional regular dilatation, a procedure which, before the operation, was not only ineffective but painful and irritating. We may place a patient in a condition of health and comfort for several years, meantime saving his bladder, ureters, and kidneys from the slowly but surely occurring grave changes which threaten his existence. Now and then, but rarely, I have met with a case in which the patient's troubles have not reappeared. I am certain we cannot reckon on this result as a rule, and I mistrust claims to the contrary as due to error of judgment, or want of information, or as prematurely made, i.e. without waiting sufficiently long to observe remote results. In enunciating this opinion I have no hesitation whatever; but in doing so the worst has been said in regard of the patient's prospects, which are generally very good.

Because, supposing, after a few years, the patient finds himself unable, through the reappearance of contraction, to pass a full-sized bougie; having, on the contrary, by degrees been compelled to content himself, at his periodical use of it, with one only half the size of that, or less, which was employed for a considerable period following the operation, division can again be resorted to. It is not a dangerous proceeding, necessarily occasioning hesitation on the part of the patient when his condition demands relief. Just as, in calculous cases, a second, a third, or even a fourth stone can be, and often is, safely removed by lithotrity when, after the lapse of considerable periods of time, fresh products are formed, thus also may a stricture be dealt with a second or a third time if necessary. The circumstances of the calculous patient were widely different when, lithotrity being unknown, the knife was the only means of removing the stone. So also when strictures were submitted, year after year, to dilatation, until it was necessary, in order to avoid impending danger, to resort to a severe perineal operation, the prospects of the stricture-patient were vastly inferior to those which a well-performed internal urethrotomy secures for him now. By the prompt and effective application of this method, the disease may be in all cases confined to the canal, and the real gravamen of the malady, the implication of vital organs, certain to result after long-continued ineffective dilatation, is altogether avoided. If the use of the bougie, which is more or less necessary after urethrotomy, ever again becomes difficult or affords little relief, then, for most patients, the time has come to repeat the incision.

I have performed this operation now on between three and four hundred patients. Some of my earliest cases were, from want of sufficient confidence and experience, less completely and freely cut than those on whom I have operated of late years: and a few of the early patients have been re-cut. I have not regretted this advice in a single instance: for the advantage to them has been undoubted. On a very few—I think three only—I have operated a third time. One of these, having suffered many years from a most obstinate and narrow contraction, has since the third operation, now twelve years ago, been perfectly free from his complaint, a very rare result. He is himself a well-known medical man.

The risk of the operation is very small. Estimating the number of patients on whom I have performed it as 340, which is within five more or less, the deaths have been six, or not two per cent. These were due to pyæmia in three; to embolism in one; to extravasation and exhaustion in two; one of the latter was a case in hospital almost thirty years ago, among my earliest, and he was unfit for any operation.

Among accidents not terminating fatally, extravasation of urine may be named as occurring four or five times, probably from removing the catheter too early. It was mostly slight, and provoking acute local abscess, rather than sloughing. The latest instance took place a few months since in a diabetic patient, seen by Dr. Pavy. He made a sound and not slow recovery, and the result of the operation on the urethra was excellent. I had not met with a similar accident for several years previously.

The sum of my experience is the expression of a strong conviction that internal urethrotomy, fully and completely performed, should be resorted to as the best and safest treatment of stricture, as soon as the easy use of the bougie fails to maintain the urethra patent, or to allay signs of irritation in the bladder arising from the obstructed urethra. It is the best means not only for relieving urethral obstruction and its painful symptoms, but for insuring the future sound condition of the more deeply seated organs.

There is still another mode of employing incisions within the urethra for the cure of stricture, which may appropriately be considered in this place. It is that which has been termed the 'excision' or 'resection' of a stricture. This proceeding was proposed by Dr. James

Arnott, in his treatise on stricture, published in 1819, but it does not appear that he had then put it in practice. His design consisted in first passing through the contracted part of the urethra an instrument, the action of which he thus describes: 'It resembles, in some respects, that of cutting out a portion of the cranium by the trephine; the whole substance forming part of the stricture is instantly removed by one push and turn of a circular knife carried against it.'[1] After this, Mr. Phillips proposed an instrument intended to act on the same principle.[2] M. Leroy D'Etiolles revived this practice, referring to it at various times since 1838, and reading a paper at the Académie de Médecine in 1855, advocating the treatment in some cases. The following is the principle on which he endeavours to show that this expedient is desirable. He says, 'Fibrous contractile strictures, obstinately resisting methodical dilatation, ought to be regarded as similar to vicious cicatrices on the surface of the body, to be treated as these; it is therefore *necessary to cut them wholly out.*'[3]

Surely there are two fatal objections to this practice? First, that the deposit in confirmed stricture exists beyond the limits of the diameter of the urethra, involving a considerable portion of the corpus spongiosum itself, and therefore cannot be removed by any such trephining apparatus. Secondly, that the wound thus made, removing as it does the mucous membrane, must inevitably be followed by the production of a true cicatrix, which, on the very theory above named, is liable to produce one of the worst forms of stricture met with, viz. that of traumatic origin, in place of the one removed.

**Narrowing of the External Meatus.**—It is by no means uncommon to meet with stricture at, or very near to, the orifice of the urethra. It may be congenital; the result of inflammation; of cicatrisation after chancre, or other lesion there. It may be the only obstruction in the canal, and yet give rise to the most painful and serious symptoms, and even to a fatal result: a case of the last-named kind has been already alluded to. I have given complete relief to distressing symptoms of long continuance, the cause of which was not suspected, by dividing an external meatus, which admitted nevertheless a No. 6 catheter. I have met with several marked examples of a similar kind, in which the very simple operation necessary was followed by complete disappearance of urinary difficulties, which had been long regarded as of an extremely obscure character. When the contraction is much narrower than that alluded to, the cause is obvious enough, but the exceptional condition should not be forgotten. The sides of the orifice in such a case are very elastic, so that, although a No. 8 or 9 bougie may be passed, the real orifice may fall far short of that calibre.

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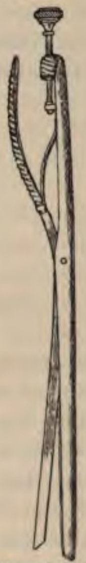
[1] Pp. 155, 156.

[2] Phillips on *Stricture*, pp. 221–223.

[3] *L'Union Méd.* Aug. 21, 1855; subsequently Leroy D'Etiolles described the proceeding, as well as that of the division of stricture by the 'écrasement linéaire.' *Bull. de l'Acad. de Méd. de Belg.* 1858, tome i. No. 2, p. 77.

All these constrictions of the orifice are remarkably obstinate, and, generally speaking, dilatation is useless, while at the same time it is extremely painful. Incision also, to be permanently successful, must be free. It may be performed with a straight, narrow-bladed bistoury; or with a small *bistouri caché* (fig. 61), which is passed through the contracted part of the canal; by pressing on the handle, the blade is opened to an extent previously determined, and, being drawn out, the section is made. It is necessary only to take care that the edge is turned directly downwards, that is, towards the frænum; and that a very free incision is made so as to divide to some extent all the soft tissues between the floor of the urethra for three-eighths or one-half of an inch, and the external surface. The object of this is, to give opportunity for passing a thread of fine silk, by means of a small needle, through the cut margin of the mucous lining of the urethra and the cut skin outside. This effectually prevents the narrowing, which is almost certain to follow, if no such means are employed to prevent adhesion of the cut surfaces and subsequent recontraction. Such a stitch should be placed on each side of the incision, and a large meatus is insured in perpetuity. To accomplish this little operation a slender knife is better than the special bistoury described.

FIG. 61.



Bistouri Caché for stricture at or near meatus.

Congenital contractions vary much in degree, frequently existing to a slight extent and requiring no treatment, although it is sometimes necessary to divide them in order to pass a lithotrite or an instrument for the treatment of stricture. It is common also to find congenital narrowing at about half or three-quarters of an inch down the urethra; but the obstruction is generally little more than a membrane, stretching partially across the canal. It may be treated by division with the instrument just described.

**Subcutaneous Urethrotomy** may be mentioned here as a proceeding which has been practised. There is scarcely any circumstance conceivable in which such an operation can be necessary. A grooved staff must first be passed through the urethra into the bladder; there is then little difficulty in carrying a slender knife, which may resemble that which is generally used in tenotomy, from the external surface, and in dividing the obstruction when its position has been carefully ascertained. But it must be an easier and a more efficient operation in most hands to make the division by passing a blade along the grooved staff by the urethra, without making a wound for the purpose in the soft parts including the corpus spongiosum, and thus inflicting a wholly gratuitous injury upon them; that is, if it be desired to operate on a grooved staff, a subject which has already been discussed at length.

The late Mr. Syme of Edinburgh formerly adopted it occasionally for antescrotal strictures. His first reported case occurred in 1841; he had applied it also in the bulbous portion of the urethra. The hazard which deep incisions here involved, from infiltration of urine, led him to abandon it, and to restrict its employment to the former situation, where he regarded the operation as successful. The late Mr. Avery also performed it in the anterior part of the urethra in two cases, the results of which he described to me as extremely satisfactory.

## CHAPTER X.

### THE TREATMENT OF STRICTURE BY EXTERNAL INCISIONS.

In some examples of stricture, so extensive and so dense is the deposit around the urethra, in some cases complicated with inflammatory deposits, to say nothing of fistulous passages, in the perineum, that it is not surprising that more considerable operative proceedings than any yet described have been devised for some exceptional forms of the disease. At various times, from an early period down to a very late one, incisions have been made from the surface of the perineum to the urethra, laying open the latter, with the view of dividing completely all the diseased tissues, of insuring a gradual reunion of the wound, and leaving a canal of the normal size. These proceedings are denoted by the term, External Urethrotomy.

**History.**—The first allusion to such methods of treatment is said to occur in the writings of Rhazes (tenth century) and of Avicenna (eleventh century). Both described puncture of the bladder through the perineum for the relief of retention of urine, but nothing more; an operation which differs as widely from division made for the cure of stricture as it does from the operation of lithotomy. I believe that there is no record of a cutting operation from the external surface of the perineum, performed for the cure of stricture and not for the relief of retention, in consequence of failure by dilatation, previous to a period about 230 years ago. Richard Wiseman, in his eighth book, on 'The Ill Consequences of Gonorrhœa,' relates that in the year 1652 he assisted that 'celebrated chirurgeon, Mr. Edward Molins, in his practice,' and describes 'one of his operations,' performed for the relief of retention, which consisted of an incision 'into the urethra near the neck of the bladder.' He states that the 'knife did not readily divide it, for it was as hard as a gristle.' The urine gushed out, and the wound continued fistulous after. Meantime with 'probes and candles' the surgeons attempted to find a passage through the urethra, but in vain. Some time after this, at the solicitation of the patient, who appears to have got tired of his perineal fistula, the *whole length, or nearly so, of the urethra was laid open from without by incisions in the middle line*, dividing the scrotum. 'The urine, nevertheless, continued to flow by the opening *in perineo*.'[1]

In the latter part of the same century, a similar operation was performed by a Dutch surgeon named Solingen, who slit up nearly the whole urethra, although solely for the purpose of applying caustics to the carnosities there. The canal was closed by twisted sutures, and the result was described as successful. Solingen is said to have practised this mode before at Leghorn.[2]

The next record, in point of time, is found in the annals of French surgery. As far back as the end of the seventeenth century an operation termed the 'boutonnière' was occasionally performed for different forms of urethral obstruction and its results. It consisted in making an opening into any part of the urethra from the external surface, either with or without a grooved staff by which to guide the knife, as circumstances admitted. This was usually done in the middle line, when anterior to the scrotum, and either in the middle or by the side of the raphè when in the perineum, the most frequently chosen site for the operation. The purposes for which it was employed were various. François Colot, the famous lithotomist, adopted it several times for the purpose of removing calculi impacted in the posterior part of the urethra, for washing out the bladder, to relieve retention of urine, and in very obstinate and impassable stricture when complicated with numerous fistulæ. He relates two cases of the last-named kind, in both of which he thus operated, in the year 1690. A canula was subsequently placed in the bladder, giving exit to the urine by the perineal opening. The urethra was then dilated, and the fistulæ cauterised; ultimately both patients were cured.[3]

François Tolet, the celebrated lithotomist of La Charité, who flourished a little before the time of Colot, has been cited by French writers as having performed the operation of external urethrotomy. This, however, he never did for the cure of stricture, only for the relief of retention of urine. He speaks of the boutonnière as performed in his time 'by men of great skill and reputation,' but only in the emergency named. He passed a grooved staff down to the obstruction in the urethra, and then pushed on a 'gorgeret' in the direction of the bladder, replacing it by a canula subsequently. Sometimes he punctured by the perineum, using a trocar of his own invention.[1]

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[1] *Chirurg. Treatises.* By R. Wiseman, London, 1692, vol. ii. pp. 427–8.

[2] *Observ. Rar. Med.* Cent-post. pars prior. By Stalpart van der Wiel. Leyden, 1727, p. 410.

[3] *Traité de l'Opération de la Taille.* Ouvrage postume. Par F. Colot. Paris, 1727, p. 235, cases 241, 243.

Jean Palfin recommends Colot's method of incising the perineum in cases of bad stricture with fistulæ, as it enabled the surgeon to withdraw the irritating urine by the wound, and to pass, from the external meatus to the perineal opening, a seton (which should be changed daily), so as to dilate all contractions there, and to wash out the bladder if necessary. He says it was frequently practised by Colot, and that he considered it 'more certain' than caustic bougies, which are 'often only palliative.'[2] Col de Vilars speaks of the practice as useful in retention, but thinks it unadvisable under other circumstances.[3]

The celebrated J. L. Petit appears, on numerous occasions, to have performed the boutonnière for retention of urine, and in some cases, when possible, he divided the stricture at the same time. He also relates a case in which he applied it for the cure of a stricture, through which neither he nor any other surgeon could pass an instrument, no retention or fistulæ being present. Here he made an incision two inches in length in the perineum, 'like that for lithotomy,' upon a grooved sound passed down to the obstruction; and the point of this instrument being then exposed, he pushed a trocar into the bladder, carefully following the supposed course of the urethra. The urine being removed, he withdrew the grooved sound, 'and the canula of the trocar served to guide the bistoury so as to cut the strictured part.' A catheter was subsequently passed and tied in, upon which the wound cicatrised in a month, and the patient was 'perfectly cured.' He states that he soon afterwards repeated the operation in almost the same circumstances, and with success; and he adds, 'all those on whom I have done the boutonnière for retention of urine have regained freedom of the canal, when I comprehended the obstacle itself in the incision.'[4] He proposed even to perform it when the urethra was patent, and consequently upon a grooved staff introduced into the bladder, but only under very peculiar circumstances, which he thus describes. Having stated, as a rule, 'that the use of the boutonnière is to be shunned whenever the introduction of a sound is practicable;' he supposes a case of acute inflammation of the bladder, with urethral obstruction, in which an instrument had been passed to draw off the water, but its continued presence could not be tolerated. He would therefore perform the boutonnière upon the sound itself before withdrawing it, lest its reintroduction should be impossible; 'in which case,' he says, 'the operation must be performed without it, a very serious circumstance, since there would be no sound for a guide.'[1]

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[1] *Traité de la Lithotomie.* Paris, 5th ed. 1708, chap. xxvi. (The 1st ed. appeared in 1681.)

[2] *Anat. du Corps Humain.* Paris, 1726, 1re partie, cap. xx. p. 174.

[3] *Cours de Chirurgie.* Paris, 1741, tome iv. p. 221.

[4] *Mémoires de l'Acad. Royale de Chir.* Paris, 1743, tome i. part ii. pp. 338–40.

Ledran employed the perineal incision in cases of retention, and occasionally in cases of impassable stricture, with perineal fistulæ; he generally employed the gorget. He details an instance where, in 1730, he made a long and deep incision of the perineum, which was deformed and riddled with fistulous openings. Not succeeding in finding the urethra, he next day selected one of the fistulæ close to the incision and passed a bougie through it, as far as he could, towards the urethra; but, still failing, he continued daily with this bougie, until on the fifth day he reached the bladder. He then introduced upon this a small grooved staff, and slit open the canal to the neck of the bladder, giving free exit to the urine, and finally substituting for the staff a hollow canula. The course of the urine being thus diverted, the stricture became amenable to dilatation, and the fistulæ healed. He cured the patient, but 'advised the use of bougies and a leaden sound in order to preserve the urethra dilated.'[2]

Astruc describes the operation as having been lately performed, but regards it as useless and dangerous. The situation of the obstruction having been determined, and a mark to indicate its position having been made on the perineum, he says: 'A grooved sound was introduced as far as possible into the urethra, and an incision made from its point on either side of the perineum parallel to the raphè. The part being well exposed to view, caustics or detergents were to be applied to the caruncles or ulcer supposed to exist there; and when all appeared to be sound, the wound was permitted to heal.[3] Daran also speaks of the same proceeding and opposed it.[4]

About this time we find the practice described by Wiseman and Astruc still in vogue in our own country. Sharp, of Bartholomew's Hospital, tells us that, on account of the extremely bad results which had followed the use of escharotics in his time, 'another kind of process has been established in their place, which in point of severity is nearly, if not quite, as objectionable. This is by cutting *in perinæo*, if possible upon a staff, and then, by the help of a gorget, to introduce a silver canula covered with a fine rag into the bladder, which is to be kept there two or three days, and then withdrawn; after which the obstructions are to be destroyed by proper digestive and escharotick medicines; at the same time, a seton is to be passed from the wound through the urethra, and out at the extremity of the penis; this seton is daily to be covered with either escharotick powder or strong digestives, in order to waste the obstructions of that part; when this is done, a catheter is to be introduced into the bladder and kept there, that the urine running off that way, the wound may more easily heal. When the wound is healed, the catheter must be taken out.'[1]

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[1] *Traité des Mal. Chir.* vol. iii. p. 7, éd. nouv. Paris, 1790.

[2] *Traité des Opérations de Chirurgie.* H. F. Ledran. Paris, 1742, pp. 368–71.

[3] *De Morbis Venereis.* Joh. Astruc. Paris, 1738, lib. iii. cap. xiv. p. 243.

[4] *Observ. Chirurg.* Paris, 1748, p. 101, and elsewhere.

Chopart employed the boutonnière in a case of fistulæ, in 1786. Having opened the urethra, he failed to get any instrument through the stricture: the fistulous openings which had previously existed healed, but the wound made by operation remained open, and by this all the urine subsequently passed.[2] Sabatier says that he followed Ledran's practice, and used the gorget.[3] Desault describes various proceedings known under the name of 'boutonnière,' and the various purposes for which they were employed, characterising the operation as either useless or dangerous when applied to the relief of stricture.[4]

But before the case of Chopart, John Hunter had practised an external operation in the perineum when a false passage existed, and prevented the successful employment of dilatation. He opened the urethra behind the stricture, pushed up a hollow canula to it, and passed a similar one down to it by the external meatus, 'until the two canulas oppose each other, having the stricture between them.' Through the upper one a trocar was then passed, the obstruction perforated; and, the continuity of the passage being established, a catheter was introduced along it into the bladder, and retained there for some time. Dilatation was employed until the wound was healed. This was in 1765.[5] When extravasation of urine existed, he also passed a director into the urethra, and opened the canal upon it.[6]

But that operation, which has been known of late years as the perineal section, Hunter performed in St. George's Hospital, in 1783, for the cure of stricture and perineal fistulæ, not for the relief of retention or extravasation. Having failed to pass the stricture with the finest bougies, and having used caustic subsequently without success, he proceeded as follows: 'A catheter was first introduced as far as it would go, as a director, and all the sinuses were laid open to that catheter, which exposed near an inch in length of that instrument;

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[1] *A Critical Enquiry.* London, 1750, p. 151.

[2] *Traité des Mal. des Voies Urinaires.* Posthumous ed. edited by Pascal. Paris, 1830, vol. ii. p. 364.

[3] *De la Méd. Opér.* Paris, 2nd ed. 1810, tome i. p. 348.

[4] *Traité des Mal. des Voies Urin.* Edited by Bichat. Paris, 1799, pp. 325-9.

[5] *Treatise on the Venereal Disease.* London, 2nd ed. 1788, p. 140.

[6] *Idem*, p. 146.

then the catheter was in part withdrawn, to expose that part of the urethra which was laid bare. The blood being sponged off, the orifice in the stricture was next searched for, and when found it was dilated. The catheter was now pushed on to the bladder, although with some difficulty.' It was tied in, the fistulæ ultimately healed, and he passed 'rather a full stream' of water by the urethra afterwards.[1] Lassus performed a somewhat similar operation in 1786, at the Hospital of St. Côme, at Paris, upon a man the subject of numerous fistulous openings in the perineum, which resulted from a blow. He introduced a sound as far as an obstruction in the urethra, divided all the fistulæ from the point of the staff downwards, and passed a gum catheter from the meatus to the bladder, retaining it there for some time. The patient was cured. This case was not published until 1825, from some manuscript notes in the possession of M. Dolivera.[2]

The application of the proceeding described by Hunter appears to have been limited, for many years, to those cases in which several perineal fistulæ co-existed with obstinate stricture. Thus it was advised, but for these cases only, by Sir Charles Bell, about a quarter of a century afterwards.[3]

The opinion at length gained ground that this method was especially applicable in cases of retention, because the accomplishment of two important objects might probably be achieved by one operation, viz. relief to the bladder, and the radical cure of the stricture by dividing it; the principle on which, as we have seen, J. L. Petit had already acted in some cases. Now, however, the urethra being opened, the rude gorget and trocar were no longer employed, but a careful search was made by means of a fine probe for the orifice of the stricture, so that the contracted canal itself might, if possible, be fairly laid open, and a full-sized catheter passed from the external meatus to the bladder. The operation was often tedious and difficult, the more so when it was the custom to seek the urethra by incisions commenced by the side of the raphè, as in the lateral operation for lithotomy, and not in the median line of the perineum.

The practice of this operation, as applied to cases of retention, appears to have been adopted in this country at the commencement of the present century. The first published account of its performance appeared in 1815, in a little work by Mr. Grainger of Birmingham, who advocated its employment, relating several cases in which he had done it, both in the central line of the perineum, and by the side of the raphè.[1] John Bell briefly suggested it for cases of retention, but had not performed it (1806).[2] Sir Charles Bell also published a recommendation of the practice in 1816,[3] which he had before given orally in his lectures. In 1811, Dr. Thomas Chevalier read a paper at the Medical and Chirurgical Society, in which he related a case of obstinate stricture of the urethra, where he made an incision into the urethra behind the stricture, but not during a crisis of retention, for the sake of fulfilling two purposes, which he describes: first, in order to withdraw the urine from the diseased parts by giving it a new course, since he had observed much benefit to accrue in this way in cases in which the bladder had been punctured; secondly, to relieve the canal from pressure occasioned by hardened tissue in the perineum.

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[1] *Treatise on the Venereal Disease*, p. 160.

[2] *Archives Générales de Médecine*, vol. ix. pp. 411 and 414. Paris, 1825, where Vanier of Cherbourg is reported as performing the same operation for fistulæ; but this took place in 1819, and has therefore no historical value, although formerly referred to as important, on which account only is it named here.

[3] *System of Operative Surgery*. London, 1807, vol. i. p. 121.

It must here be observed that all these operations, excepting the two of J. L. Petit referred to, were employed to cure some serious complication of the stricture, and not the stricture itself; or, if directed against the stricture, it was for the purpose of laying open the part to view, so as to apply freely some kind of caustic. In other cases there was always present either retention of urine, or extravasation, or false passage, or fistulæ. In no case was the single indication of curing an obstinate stricture held to warrant the performance of the cutting operation. Petit alone had so regarded it, but, having exposed the point of the sound, he forced a passage at hazard by means of a trocar, an essentially different proceeding from carefully dissecting through the narrowed passage.

The first record, as far as I am aware, of this latter operation, as applied to the relief of impassable stricture, unaffected by the complications referred to, is to be found in a paper by Mr. J. M. Arnott, then of the Middlesex Hospital, read at the Medical and Chirurgical Society in June 1822. ('Trans.' vol. xii. p. 351.[4]) A case is related in which the author, being unable after repeated efforts to pass any instrument through the stricture from the external meatus, had operated with the most satisfactory results. and advocating an adoption of the same method in similar cases. In this instance, having cut upon the point of a sound carried down to the stricture, Mr. Arnott succeeded in passing a very small grooved probe through, and in dividing the contraction upon it. A silver catheter was then carried into the bladder, and retained there, being withdrawn at occasional intervals only, and the wound was allowed to heal over it. The patient experienced a complete cure; for during six or seven years subsequently, during which he remained under Mr. Arnott's observation, there was no return whatever of the complaint. Of late years this proceeding has become known as the operation of 'perineal section,' by which term I shall in future speak of it.

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[1] *Medical and Surgical Remarks.* By E. Grainger. Chap. i. London, 1815.

[2] *Principles of Surg.* vol. ii. p. 285. London, 1806.

[3] *Surgical Observations.* By Charles Bell. Part I. p. 56. London, 1816. More than one French author has recently claimed the credit of first performing this identical operation for Eckström, whose first case (for the relief of retention, not for the cure of stricture) was published in *Froriep's Notizen*, vol. xviii. p. 155. Weimar, 1827. (!) Chelius gives an account of this operation in his *System of Surgery* under the subject 'Retention of Urine,' but is not aware that it was described in England twelve years before. The accomplished editor of Chelius in this country, the late Mr. South, says, in a note, that Eckström stayed in London some months about the year 1821–2, and 'must have seen it performed again and again in the precise way in which he describes it.' Vol. ii. p. 428.

[4] The propriety of performing such an operation is considered, and partly entertained, with a view to future practice, by Sir C. Bell, in the *Treatise on the Urethra*, &c. London, 1822, 3rd ed. p. 184.

The late Mr. Guthrie, in a work published in 1836, containing a portion of his lectures delivered at the Royal College of Surgeons in the year 1830, recommended the operation of opening the urethra behind a stricture in cases of retention; and in those instances in which the stricture 'is of a thickness, hardness, or extent leading to the expectation of the cure (by dilatation) being difficult or prolonged,' to divide the contracted part itself also, commencing at the opening thus made, and consequently in a direction *from behind forwards*.[1] He also strongly insisted upon the necessity which exists for making the incisions in the middle line, and not at the side of the raphè. Mr. Guthrie also recommended the same proceeding as the best method of incising an impassable stricture, when it is considered necessary to resort to perineal section for its cure, and not during the crisis of retention. His own description of the operation, which is detailed with care, and at considerable length, is given in chapter xi. on 'Retention of Urine,' to which the reader is referred.

**The Perineal Section.**—By this term is to be understood the operation to be undertaken, when the surgeon has satisfied himself after sufficiently prolonged and careful attempts with the smallest instrument, that the stricture is, at all events as far as he is concerned, impassable. In brief terms, it consists in making an incision from the perineum down to the end of a sound firmly maintained against the face of a stricture, and passing a grooved director through upon which to divide it, after which a catheter is to be passed through the whole urethra into the bladder and fastened there. The mode of performing this operation is as follows: The patient should be placed in a good light on a table—not upon a bed, so that the pelvis may not sink—and be secured as for lithotomy. The bowels should have been previously cleared by an enema. The perineum having been shaved with a scalpel, a catheter is to be passed as far down the urethra as the obstruction will permit, and held firmly in that position by an assistant, who at the same time draws the scrotum forward. An incision through the skin and cellular tissue is now made, directly in the middle line of the perineum, along the raphè, from over the point of the catheter to within a short distance of the anterior margin of the anus, if the stricture be at or near to the bulb of the urethra, and the point of the catheter is to be exposed by a shorter and deeper incision. The sides of the opening are then to be carefully held apart as widely as possible with hooks, by an assistant on each side, so as to give the operator as clear a view as possible of the contracted opening; and this object is further to be promoted by a diligent sponging of the part; or, better still, as Mr. Avery first suggested and practised, a loop of thread should be passed through each margin of the urethral incision, including the mucous membrane close to the stricture, so as to open out the passage, and dispense with hooks or fingers, which might intercept the view. The loops serve also to guide the eye to the exact spot at which the stricture commences, during any stage of the dissection which it may be necessary subsequently to make.[1] This done, the operator, who should be provided with two or three grooved silver directors of the very smallest size, should endeavour to carry one of them through the contraction, and if he be successful in accomplishing this, the division may be made with ease and safety. He may not be able to pass the director more than two or three lines until, having made a careful division so far, he may be enabled again to follow the course of the contracted canal, and to divide another portion of it upon the instrument; but if one of the directors cannot be introduced, either partially or entirely, no alternative remains but to dissect through the structures in the median line, endeavouring to follow the urethral canal as closely as possible. In either case, as soon as the continuity of the passage has been restored, the catheter first employed is then to be carried onwards into the bladder, and secured in the usual manner.

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[1] *Anatomy and Diseases of the Urinary and Sexual Organs.* G. J. Guthrie, F.R.S. London, 1836.

Mr. Wheelhouse, of Leeds, has added an improvement, which may be thus described:

The operation is commenced by passing his grooved staff, which terminates with a button-like end, as far as to the stricture—not too close to it—and then, making the usual median perineal incision, the urethra is to be opened a quarter of an inch in front of the stricture. The edges of the urethra are to be held apart by straight-bladed nibbed forceps, while the assistant turns the grooved staff so as to bring the button round to the front and make the groove face the pubes, out of sight. With this button the upper angle of the wound is drawn up, so that the anterior face of the stricture is exposed to view. It is rare indeed if the operator cannot now discover the orifice, enter it with a fine probe, and follow its course throughout. The stricture may be divided thereon, or on the grooved staff pushed through first, with the groove now facing the operator; in either case free division of all stricture tissue is to be made. Then the tapering probe-pointed gorget, or some similar wide-grooved director, is passed along the grooved staff into the bladder, and a free course insured and demonstrated. The after-treatment is conducted for three or four days by the inlying catheter in the usual way.[1]

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[1] Soon afterwards, M. Sedillot, Professor of the Faculty of Medicine of Strasbourg, being evidently unacquainted with Avery's proposal, advocated the employment of this method, describing it as an improvement of his own, in a paper read to the Académie des Sciences at Paris, and reported in *L'Union Médicale* of Nov. 6, 1852.

Now, as to the applicability of the operation of perineal section, whatever may be said of it in circumstances of retention, the consideration of which will come hereafter, the case must be an exceptionally difficult or an unusual one in which this method must be adopted as a means of cure. Some uncertainty attends an attempt to divide, by mere dissection from the surface of the perineum, a portion of contracted urethra, whose calibre has been exceedingly reduced, especially if the tissues are much thickened; and few would undertake to assert, unless a grooved director can first be passed, that an accurate division can be insured, or, indeed, that it is ever made. Thus Sir B. Brodie says: 'Even under the most favourable circumstances it cannot be otherwise than doubtful whether the stricture be properly divided, that is, whether the incision has passed through the narrow canal in the centre, or through the solid substance on one side of it. I suppose that no surgeon would recommend such an operation except as a last resort, where no instrument could be made to pass through the stricture by other means.'[2] Every chance of getting an instrument through the stricture that can possibly be derived from the employment of rest and constitutional treatment, in addition to the most careful and repeated manipulations, should be exhausted before we consent to employ it, failing in which, its necessity and utility may be admitted as a last extremity.

In reviewing the history of external operations performed in the perineum, which has been given somewhat at length on account of the imperfect statements which have been made respecting it by some authors (as an example of which see notes at pages 173–4), it appears that these have long been recognised as necessary to the cure of some cases of stricture which have been impermeable to any other method; and during the former half of the century a good many such cases were thus treated. That many instances in which they have been performed have terminated fatally is a fact too notorious to need corroboration by cited reports. Nor would a classified table of such cases furnish data of any utility in testing the value of the operation. For it has been rarely performed except as a last resource, in certain old strictures of the worst kind, and in these renal disease often co-exists, and renders the patients particularly bad subjects for any operation. And with such a class of cases it is impossible to decide what percentage of deaths should be considered as favourable or adverse to the operation, as indeed it also is in many of the individual cases, to apportion the respective influence of the disease, and of the remedy, in bringing about the fatal result.

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[1] *Perineal Section.* By C. G. Wheelhouse, F.R.C.S. *Lancet,* June 24, 1876, pp. 779–80, with woodcuts.

[2] *Op. cit.* p. 67.

During the last thirty years, however, this operation has been very little employed, and mainly because it has been more generally held that very few, if any, strictures really impassable by instruments exist. This has been owing in great measure to the strenuous assertion of the late Mr. Syme, of Edinburgh, that when urine passes externally by the urethra, however small the quantity, a catheter may by patience and perseverance be safely carried through it into the bladder. This doctrine, formerly combated with much energy, is now accepted to a considerable extent by practised surgeons. At all events, if not held to be of universal application, the exceptions are regarded as being very few in number. It was also formerly regarded as a rule that when a sound of any size can be passed through a stricture into the bladder, division of the stricture from the surface of the perineum is certainly contra-indicated.

In 1844 Mr. Syme published, in the 'Edinburgh Journal of Medical Science' for October, the report of a case of stricture, in which he had applied dilatation both temporary and prolonged to their fullest extent, and afterwards internal incisions, without in any degree improving the patient's condition; for he found the tendency to contract so strong, that within the subsequent twenty-four hours of each operation, at which large bougies had been passed with perfect ease, the stricture was still as narrow and as difficult to pass with a small instrument as ever. His patient protesting 'that life was not desirable under the torment of his complaint,' requested that any other means of cure might be adopted, 'no matter at what expense of pain or risk of danger.' Accordingly, Mr. Syme passed a grooved sound into the bladder, and divided the stricture upon it from the perineum. The patient enjoyed for many years good health and freedom from these painful symptoms.

After repeating this operation several times in cases of a somewhat similar character to the foregoing, Mr. Syme proposed it for general adoption, stating his belief that 'external division'[1] upon a grooved sound is a complete remedy for the most obstinate forms of stricture, while, for some cases of a less obstinate character, it affords a more speedy, safe, and permanent cure than simple dilatation.[1]

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[1] It is desirable to use 'external division,' or 'external urethrotomy,' to designate Mr. Syme's operation, since he himself applies it, and to limit 'perineal section' to that proceeding described at pages 176-7, which is resorted to in cases of *impassable* stricture.

This of course assumes the non-existence of 'impermeable stricture.' But the term itself is open to great objection. If urine passes through it, 'impermeability' of the urethra cannot be affirmed to exist. If 'impermeability' to instruments is intended, then it can only apply to the operator who has failed, and who may be followed by a more practised hand who succeeds. Clearly, then, the term 'impermeable' denotes the quality of the surgeon and not the condition of the stricture. For it is to be borne in mind that 'stricture' does not imply an obliteration of the urethra, but only a narrowing of it. Obliteration is a different condition, occasioned by different causes to those of stricture—usually, indeed, by some severe traumatic lesion. It is not common, but not so rare as some writers seem to have supposed, who have quoted a single case noted by Chopart, and another by Cruvelhier, to illustrate the observation, since in our own Museums are several examples. The reader is referred to several preparations mentioned at pages 34-5, and in the Appendix, which are undoubtedly examples of obliteration, not of stricture.

The late Mr. Liston, however, enunciated the same view, although it obtained less prominence at that time than it has hitherto done. In a clinical lecture (1835) he used the following words: 'It has been proposed in what are called "*impassable strictures*"—but there are no strictures impassable that I have ever seen, for *where any water comes away*, you can by patience and perseverance get a catheter through sooner or later, to introduce,' &c. He afterwards proceeds to remark under a separate head, upon cases of complete obliteration, arising from traumatic injuries of the urethra, stating that he treats *them* by passing down an instrument as far as possible, making an incision in the line of the raphè upon its point, and carrying it onward into the bladder after.[2]

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[1] *Stricture of the Urethra.* By James Syme. Edin. 1849, p. 58.

[2] *Lancet*, Feb. 20, 1836. Report of a Clinical Lecture by Robert Liston.

The urethra being obliterated, as sometimes happens after wounds in the perineum, or from sloughing after extravasation, the urine passes through a free opening in that region. In such cases, which are totally distinct from stricture, Mr. Syme has proposed the following procedure, which he prefers to the ordinary mode of cutting down on the end of a catheter, because he believes it will insure the production of the new channel in a more direct and natural course between the two portions of the canal than can be attained by dissecting with a knife. He directs the operator 'to introduce into the bladder through the fistulous opening—which, if necessary, might be dilated—a staff, like that used in lithotomy, but with the groove on its concave instead of its convex side; then to insinuate through the urethra, so far as possible, the guide director employed for dividing strictures by external incision; and while the staff, confided to an assistant, was supported by the finger of the operator on the perineum, or in the rectum to push the

From the numerous pathological facts afforded by our Museums, it appears, then, that obliteration of the urethra does exist; that it is unquestionably rare; lastly, that strictures which are not of traumatic origin probably never arrive at that condition.

Mr. Syme's assertion, then, amounted to this, and can be understood to mean no more, viz. that wherever the urine passes out by the external meatus a catheter may at some time or another be got in. Thus he writes: 'As to the question of "impermeability," I simply maintain, that if the urine passes out, instruments may always, through care and perseverance, be got in beyond the contraction. It should be observed that the case here is quite different from that of a distended bladder requiring *immediate* relief. I have never maintained that in such circumstances the introduction of a catheter was always practicable,' &c.[1] And I think that there are few surgeons of experience in the use of the catheter who will deny the truth of this axiom as a rule; and such, if repeated opportunities are afforded of making the trial, will succeed in overcoming very nearly all the cases which come before them by fair means. Several trials are sometimes necessary; but it has never fallen to my lot hitherto to fail ultimately to pass, by very gentle means, a slender catheter through any stricture into the bladder. Two, three, or even four serious and prolonged attempts may be necessary, but by very gentle handling it is rare indeed that success may not be attained. It is at least fifteen years since I have had occasion to perform perineal section for an impassable stricture, and I had twice only been compelled to do so previously. Syme also did the operation only three times after his declaration referred to.[2]

In reviewing this question we nevertheless learn a very useful lesson on the permeability of stricture to instruments. No one can deny that a degree of dexterity in the use of the catheter is attainable by practice, which renders success in its employment almost certain, even in the worst cases. It is wise, and certainly conducive to the cultivation of skilful practice, to be well assured of the powers of the instrument, to cherish confidence in them, and to seek the facility which experience gives in doing that which, in the oft-quoted words of Mr. Liston, is 'one of the most difficult in the whole range of surgical operations.'

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director onwards in the direction it ought to take if the canal were free, so as to pass through the obstructing texture, enter the groove, and proceed into the bladder. The state of matters being then similar to that of a stricture requiring division, after the director has been passed through it, there would be no difficulty in placing a knife in the groove, and cutting outwards, so as to divide completely, in the exact line of the urethra, all the thickened substance concerned, and afford free admission to a full-sized catheter, which may be allowed to remain for two or three days, to prevent any risk of extravasation.' Two illustrative cases are appended.—*Med.-Chir. Trans.* vol. xl. p. 113.

[1] *Edinburgh Monthly Journal*, June, 1851 art. vi. By Professor Syme.

[2] *Op. cit.* 2nd ed. 1855, pp. 36 and 95.

Most assuredly the cases are few in which a sound may not be passed by a skilful and persevering operator, perhaps fewer than they have generally been supposed. For my own part, I am free to confess that I have assuredly learned one thing, viz. that confidence in the power of the catheter and perseverance in its use constitute the secret of successful practice in its application to a stricture, the extreme narrowness or situation of which renders its reduction extremely difficult.[1]

Proceeding, then, upon the assumption that there are no impermeable strictures, and using the term to embrace an extent of signification which has been just explained, Mr. Syme proposed to reverse the maxim which was stated a few pages back to be an axiom accepted by the profession hitherto, viz.:

*A stricture being permeable to instruments, external division is contra-indicated;*

And to make *permeability an indispensable pre-requisite to the performance of external division.*

**Mode of Performing External Division on a Grooved Staff.**—Supposing it is decided to perform this operation, a clear idea of the precise situation and extent of the stricture should be first attained. We ought to be able to put a finger on that spot in the perineum (supposing it perineal) which corresponds to the strictured part of the urethra, and to realise its locality and extent in the mind's eye. The performance of a complete division of the entire portion of the urethra which is narrowed, and the limitation of the incision to a small additional portion before and behind it, are the conditions necessary to a successful result in regard of the operation. It is this which requires the exercise of care, patience, and some little skill, and thus it may be most readily and certainly attained.

First of all we should ascertain the distance of the contraction from the external meatus, and the extent to which the urethra is involved in the usual manner. (See pp. 81–2.) While the exploring bulb is still *in situ*, we may distinguish its situation by applying the fingers to the perineum, and, simultaneously moving the instrument with the other hand, mark with the eye the exact point in the perineum which corresponds to the obstructed point in the urethra.

**Steps of the Operation.**—The staff should have a 'shoulder' to rest against the anterior limit of the stricture. It is represented of half the actual size at fig. 62; the stem or shaft equals in girth about a No. 9 (English) catheter: it then lessens where the curve commences to the size necessary to pass through the stricture, generally about No. 1 or 2, and this latter portion only is grooved. When the slender part of the instrument has been passed through the stricture, its anterior limit stops the shoulder, which is easily felt by the forefinger through the tissues, and becomes a guide to the contraction, provided the staff is maintained steadily in its position. My own staff is constructed with a hollow throughout, by which the urine issuing when it arrives at the bladder shows that the instrument is in its proper place, a satisfactory assurance when false passages exist and render the right route difficult of access.

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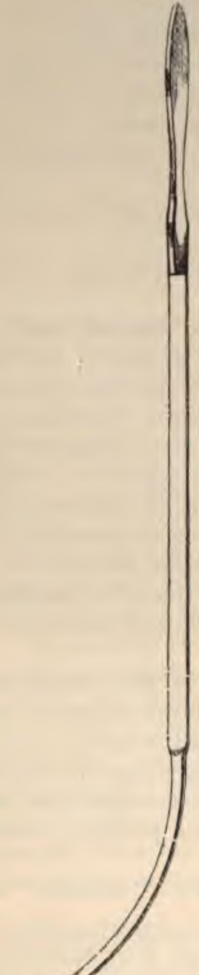
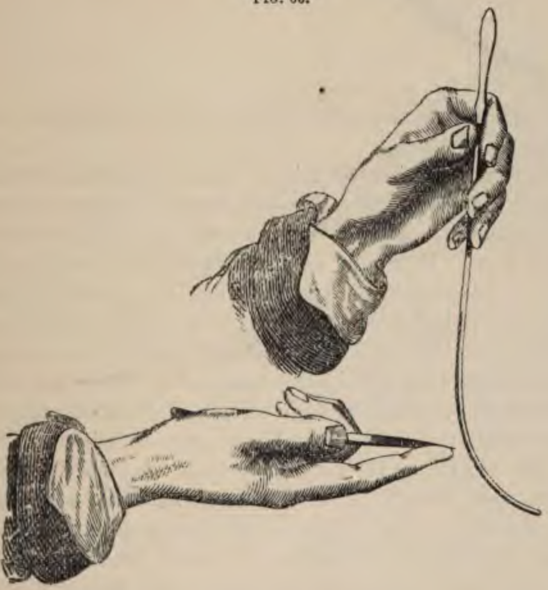
[1] The doctrine that all strictures may be rendered permeable to instruments, if time and gentle efforts are expended on them, soon, thanks to Mr. Syme's unflinching advocacy, widely spread, and led to notable improvement in practice. In Paris the subject excited attention, and Nélaton, supporting Syme's view, announced, as a triumph, the passing a slender instrument into the bladder, through a previously 'impermeable' stricture, after an attempt of two hours' duration, by the hand of M. Phillips. See his Clinique, *Mon. des Hôp.* 1857, p. 569; also a paper by Guillon, *Gazette Méd.* 1858, May 8; also *Gazette des Hôp.* March 27, 1858. Papers by Phillips, *Bull. de Thérap.* April and May 1858. Papers by Mercier, *L'Union Médicale*, July 6 and 8, 1858.

FIG. 62.



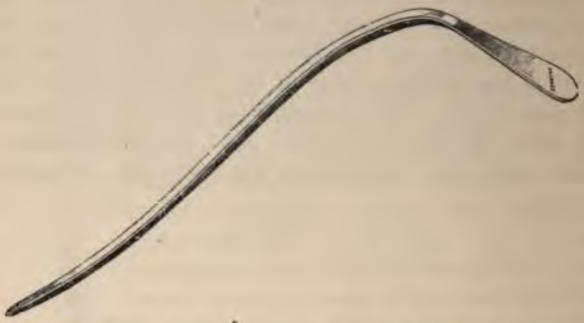
The patient being placed and secured as for lithotomy, the staff is introduced; an assistant holds the staff upright, and draws up the scrotum with the left hand. The operator, seated, makes an incision in the line of the raphè, from above downwards, about two inches long, and follows the direction of the median line, until he can distinguish the shoulder, and by that is guided to the position of the stricture, when, taking a sharp straight bistoury in his right hand and the staff itself in his left, which he holds firmly against the stricture, he engages the point of the knife in the groove of the staff about an inch below the shoulder, and cuts upwards to the extreme upper end of the groove, which penetrates into the thick portion of the staff for a short distance. This position of the knife is well represented in the cut (see fig. 63); the blade lies along the forefinger of the right hand, with its cutting surface uppermost, the tip of the forefinger guarding the point. With the finger in this position, the operator makes the division in the manner just described of the whole of the contracted part; and as this may still not be entirely cut in the anterior direction, even when the knife has reached the upper end of the groove (for the tissues are apt to be pushed upwards and not cut, even when the knife is quite sharp), it is as well to draw out, or upwards, the staff for half an inch or so, and divide farther to that extent. If the stricture has been properly divided, the shoulder of the staff may now be passed downwards through the incised part with the greatest freedom ; if so, it may be withdrawn, and a catheter passed in its place. Since, however, the point of a catheter sometimes catches in the wound, and does not go readily into the bladder, from the urethra occasionally collapsing at the posterior limit of the incision, I prefer to introduce through the wound, before withdrawing the staff, a concave curved director along the convexity of the staff, into the bladder. (See fig. 64.) The staff being withdrawn, the catheter, on arriving at the wound, glides securely and certainly along the director into the bladder. But it is a matter of importance that no portion of the stricture should remain uncut. If, therefore, the catheter used (which should not be smaller than No. 12) be at all obstructed at any point of its passage, and be obviously grasped after it has been passed, we may rely upon it there are a few fibres yet requiring division, and which will assuredly occasion future trouble—that is, will cause relapse, if they are not incised. Wherever they are situated, they should be freely divided.

FIG. 63.



If the bleeding is free, as it may be in exceptional cases, perfect safety is insured by plugging the wound. The catheter being secured in the usual way, a piece of india-rubber tubing is attached to it, and one end placed n a vessel. The patient lies on his back in bed, the legs supported by a pillow under each ham.

FIG. 64.



At the end of two, three, or four days, the bladder is emptied and the catheter withdrawn.

With regard to the time at which dilatation should be commenced, about four or five days after the withdrawal of the catheter suffices for the first interval, and then the instrument which was tied in ought to pass with ease. It should be used again in about four days, and be repeated with the same result. But if any marked obstruction appears at any point in the urethra, it is certain that the stricture was not wholly divided, and if the patient is otherwise doing well, we should not hesitate to divide the remaining fibres, by any method which appears the most suitable in relation to their situation.

Subsequently it will be desirable to pass a full-sized instrument, such as a No. 11, 12, or 13 bougie, once a week for a few weeks. The patient can mostly learn to do this for himself in a short time. It may then be used once a fortnight, and finally once a month, and the practice may be continued at such intervals as are required.

I may here consider an objection which has been made to any free division of urethral stricture, on the ground assumed that any section of the urethra will of itself produce narrowing, through the known contracting property of cicatricial tissue formed in the healing process.

Now, if it be intended by this statement that the section of the urethra made in the operation *adds* another source of narrowing to the pre-existing one (and the objection loses its weight if less is intended), the result must necessarily be that the patient is always *worse* after the operation than before, which is manifestly contrary to fact, the most serious allegation respecting after-results, indeed, being that in some cases he is no better after the operation.

Supposing, however, for argument's sake only, that the result of this incision *is* contraction, if, at the same time, that incision has diminished materially the pre-existing contracting tendency of the old stricture to which it was applied, so that the balance is now in favour of the patient, there being a smaller total amount of contraction after the operation than before—which is the fact beyond all question—then to name the first result and omit the second is tantamount to a suppression of the most important fact in the case, and the objection vanishes.

But that the result of the incision is contraction has yet to be proved. Clean incisions do not produce contractions anywhere. Wounds, with loss of substance, filled up by granulation, alone produce contracting cicatrices. Is it necessary to state that the cicatrix itself only contracts? If no portion of tissue, therefore, is removed in the incision, the adjacent parts remain in bulk and position as before, no vacant space having to be filled up. So much for general principles; now as to their application to the urethra. Does the urethra narrow after the incision for lithotomy? Certainly not. Further evidence is superfluous; but, if more were wanting, M. Reybard's special and extended researches have, on this very matter, proved (had proof been necessary) that longitudinal incisions of the urethra never cause contraction, while undoubtedly contused wounds, with loss of substance, or transverse wounds adhering inaccurately, are common causes of urethral stricture.

But there is a theory that, by means of proper management, a longitudinal incision in the urethra may be followed by the interposition of a portion of new tissue between the cut walls of the wound, and that the production of what has been called an 'interstitial splice' is an important object to be attained by internal urethrotomy. It is only contended, of course, that this result can be achieved by making a tolerably free incision of the stricture and adjacent tissues; no scarification or moderate incisions are followed by the formation of the cicatricial splice. Granting, then, that the necessary free incision has been made, it is assumed that by keeping the lips of the wound apart by passing a large bougie daily for two or three weeks, and thus preventing union by mere adhesion of the cut surfaces, a considerable amount of granulating tissue will be produced, and that as the wound slowly heals this tissue will have filled to a material extent a gap between the surfaces, and formed the splice in question. Perhaps this process may take place, and for a time a piece of tissue may thus have been 'let in,' as a mechanic might say, to supplement the narrowed canal. I cannot attach great importance to the practice, seeing that such tissue notoriously loses its original extensibility with great rapidity and soon disappears. Nevertheless, it can probably do no harm to regard the theory with some favour, and to carry it out in practice.

Relative to the risk attending the perineal operation, it must no doubt be regarded as greater than that which attaches to minor procedures adopted for the treatment of stricture. The danger arising from the operation is small; but the patients on whom it is performed are no doubt often unpromising subjects for any surgical operation, owing to the existence of chronic disease of the bladder or of the kidneys. There is one source of danger to which the patient is exposed, that of free hæmorrhage, but this has been rarely met with. A free section of the corpus spongiosum must often be made, and this must sometimes involve the risk named. Yet, with good management, bleeding is not difficult to control: a catheter being in the bladder, any perineal wound may be securely plugged without much difficulty.

The cases for which this operation may now be reserved are mainly those in which large, numerous, or obstinate perineal fistulæ co-exist with old or obstinate strictures. When other treatment has failed, and the fistulæ refuse to heal, even although the patient has for some weeks withdrawn his urine entirely by catheter, no proceeding perhaps offers so good a chance of cure as this. It is for such cases it should be reserved now; and as these are extremely rare, it is seldom necessary to have resort to it. Under such circumstances I have performed it altogether not more than ten or twelve times, in addition to nine cases of the original 'Syme's operation,' done for the cure of uncomplicated but severe stricture, and published in an early edition of this work. Not one has been fatal; and the results have been, on the whole, satisfactory, and warranted employment of the proceeding as a last resource in the worst form of disease.

**Concluding Remarks on the Treatment of Stricture.**—Arrived at that part of this work which concludes the treatment of stricture, properly understood, and before proceeding to the consideration of fistulæ, urinary retention, &c., there is one observation for which this appears to be the appropriate place. It is this—that no single species of treatment ought to be vaunted as the one exclusively appropriate method. Perhaps in no department of surgical therapeutics has greater dogmatism prevailed; perhaps in none is it so unwarrantable. Every surgeon who possesses tact, patience, and judgment, and of course a requisite experience, may undoubtedly treat successfully by his own favourite method, whatever it be, a large proportion of the cases that apply to him. But his success should not lead him to imagine or endeavour to persuade the world that his method is the only true one. The cure depends far less on the system selected, or the particular instrument employed, than on the man's own judgment and skill in applying it. Hence it is that the partisans of every rival method can and do most legitimately claim triumphant successes, each for his own pet scheme. The exhibition of these selected cases does not prove much as to the inherent superiority of one method over another, and the very system which in one man's hands gives good results may utterly fail in those of another who attains equal results by a different course. One thing is certain—it is, that no one method can be successfully applied to all the varieties of the complaint which a large field of practice produces. We cannot possess too many resources. We shall be unwise to deny ourselves the right to select with discrimination for each case its appropriate remedy. Such is the lesson which, I believe, is learned by most of those whose study and experience of the subject has been comprehensive and extended, and whose judgments are not warped by that predilection for a particular method which those who have discovered, introduced, or in some way become identified with it, are so prone to exhibit in a greater or less degree.

## CHAPTER XI.

### RETENTION OF URINE DEPENDING ON URETHRAL OBSTRUCTIONS.

RETENTION OF URINE depending on stricture may be *complete*, as when no urine will pass, although the bladder is full; or it may be *partial*, as when the bladder is quite or nearly filled, and the surplus runs off; in other words, it is engorged, and its contents overflow.

The latter state is often called, but erroneously, incontinence; this term can only be correctly employed to designate a condition in which the urine is continually flowing against the will of the patient, because the bladder has lost the power of retaining. True incontinence is a rare occurrence in the adult male, except from cerebral lesion. This is a fact which it is of the utmost importance that every student should know. It is an axiom, the value of which in practice cannot be overrated, that 'AN INVOLUNTARY FLOW OF URINE INDICATES RETENTION, NOT INCONTINENCE.' How often has the overflow of surplus urine from an engorged bladder concealed the real condition from an inexperienced practitioner, leading him to believe that the viscus was empty, instead of the subject of a, perhaps fatal, retention!

There are various causes which give rise to this affection. Among these enlarged prostate is the most frequent. We have only to consider that form which depends on stricture of the urethra.

In the treatment of a case in which the urine flows involuntarily the first point, therefore, is to ascertain whether the bladder be empty or distended. In the latter case it sometimes forms a supra-pubic tumour, which gives an absolutely dull sound on percussion, it may be even as high as the umbilicus, communicating to the hand a sensation something like to that of an enlarged uterus beneath the abdominal parietes. In such circumstances the patient is often astonished to learn that his urine has been abnormally retained, as he naturally enough supposed the converse condition to be the case. The treatment consists in emptying the bladder by the catheter, which of course must be adapted to pass through the stricture, and this must be done subsequently at periodical times, so as to prevent distension and favour an habitually contracted state of the bladder.

We cannot be too strongly impressed with the necessity of looking for the presence of retention in all cases of urinary obstruction. The oversight of it by the attendant has sometimes cost the patient his life, instances of which are unhappily too frequent. The retention may be partial, and no overflow may co-exist, the patient habitually passing a portion only of the contents of his bladder, and leaving therein some ounces, which become stale and inflict injury upon the mucous membrane in contact with it. This state of things may not unfrequently be discovered when not suspected, if the experiment of introducing the catheter be made shortly after the patient has passed water.

**Complete Retention.**—Whenever organic stricture exists, the possibility of an occurrence of complete retention of urine at any time is always to be apprehended if exposure to the influences of certain exciting causes takes place. What these causes are have already been considered. The resulting local condition is occlusion of the passage, generally at the point of stricture, either by inflammatory engorgement, unwonted contraction, or perhaps by a combination of both. Lastly, retention may be caused by the presence of some foreign body, carried to the stricture by the stream of urine in the form of a small calculus, a portion of membrane, or the like, obstructing the otherwise open passage, and this is probably the rarest form.

**Treatment.**—In treating a patient suffering from absolute retention, in nine cases out of ten, the catheter is the first and often the only means required. One or two inquiries at the most generally suffice to determine the first point to be ascertained, viz. is it a case of merely temporary obstruction, depending upon acute inflammation following an attack of gonorrhœa, or is it a retention supervening on organic stricture of some standing? The next points to be learned are the duration of the attack and the condition of the bladder by percussion, always remembering that while a young and healthy subject may exhibit absolute dulness almost to the umbilicus from distension of that viscus, the subject of an old stricture may be in a state of much greater danger from distension than the former, although no dulness is perceptible above the pubes from the contracted condition of the bladder, which is now natural to him. Two or three minutes' examination will supply all the particulars it is necessary to be acquainted with. In all cases the object to be effected as speedily as possible, compatible with the safety of the patient, is evacuation of the urine.

Next comes the inquiry, how is this to be accomplished? Should the treatment vary materially in the two cases just briefly described?

In some respects doubtless, but not greatly. Take the first case, that of temporary inflammatory obstruction. Such an one is liable to occur after a sudden check to a gonorrhœal discharge, or from indulgence in free drinking, or in venereal excesses, before such a discharge has been cured. The subjects are generally young men. On examining the penis, it is probably hot and tender to the touch, the lips of the meatus are red and tumid, and some purulent discharge may be apparent. It has been recommended in such cases to employ baths, opium, and depletion, before having recourse to the catheter, and there is no doubt that relief may generally be afforded in this manner, although at the expense of considerable and prolonged suffering on the part of the patient. The advocates of the constitutional plan state that great injury may be inflicted upon the urethra in its inflamed condition by the catheter, which is thus avoided. This also is true, but if the surgeon has been tolerably practised in its use, and, above all, if he will be cautious and gentle in the management of it, the anxiety on that point is needless. No doubt a hot bath, a full dose of opium, or a full cupping on the perineum, may facilitate the passage of an instrument, or even render it unnecessary; and one who is unaccustomed to use the catheter has, therefore, a better chance of success from these than by instrumental interference at the outset. A flexible catheter, No. 5, 6, or 7 in size, without a stylet, should be very gently passed, and this will almost always succeed without a resort to other treatment. However, if the obstruction is not overcome by gentle catheterism, the hot bath should be employed for the whole body, and the urethra be let alone for a time. The temperature should not be less than from 102° to 110°, in order to relieve the local congestion by filling the vessels of the skin and inducing copious perspiration, and to favour the relaxation of muscular spasm. Hence it is not uncommon to find the patient passing his water in the bath. But if this does not take place in about twenty or thirty minutes, after maintaining or augmenting the temperature so as to insure its full effect, he should be removed, wrapped in hot blankets, to bed. A full dose of the liq. opii sed., say thirty or forty minims, may be given by the mouth, or as an enema in about two ounces of gruel. Opium is often of great service, because the powerful efforts to make water which accompany retention are, as has before been shown, to a great extent involuntary, and when they are allayed the urine will sometimes flow spontaneously. Undoubtedly, if the operator is not expert in the use of the catheter, and in some cases if he is, opium is the safest remedy. Mr. Skey thinks 'there is nothing at all comparable to it in the great majority of cases.'[1] Supposing that about two hours have now elapsed, in the majority of such cases, considerable relief will have been obtained by the passage of some urine, although probably in a small stream. An active purge should be administered, so that rapid and efficient action of the bowels is provided for. When this occurs, the stream of urine accompanying the evacuation will sometimes be tolerably free.

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[1] Lecture at the College of Surgeons, May 1854.

But supposing that no relief has followed the treatment. At all events the condition of the urethra has probably been improved by it, and the catheter may now be employed with success. Should, however, further adjuvants be required, another dose or two of opium, during two or three hours of rest from other interference, will probably afford the desired relief.

Respecting the employment of the tinct. ferri sesquichl. which formerly, at all events, was regarded by some almost as a specific in cases of retention, there is little to be said. It has appeared to be useful in some cases, but is rarely now relied upon sufficiently to enable any trustworthy observations upon its powers to be made. Such have been instances in which the retention has seemed to be due more to spasmodic than to organic constriction. The dose usually given is about 15 minims every quarter of an hour for three or four times, after which any favourable results it could induce might be expected to take place. As to the rationale of its action I have nothing to offer. Possessing other means, in which much greater confidence may be placed, it may be deemed a remedy of little importance.

The bladder will bear a good deal in these cases. Rarely, if ever, is it necessary to resort to other operative measures for its relief beyond those already detailed. Some modification, however, of the treatment described may sometimes be necessary in the second class of cases, viz. those in which retention supervenes upon an organic stricture of some standing. Such as these form the examples of retention ordinarily met with. The instances in which no organic constriction has pre-existed are much less common. It may be difficult, perhaps, always to ascertain what is the immediate excitant of the attack: exposure to cold, the use of an unwonted kind or quantity of liquor, and violent exertions, are frequent causes.

We should begin by choosing a catheter which will acquaint us with the situation and condition of the obstruction, as No. 7 or 8. The patient will, most probably, be able to say what is the habitual size of his stream, and what instruments have been used in any previous treatment, together with some other fact which it may be useful to know. Having ascertained the locality of the stricture, we should devote some time to a patient and careful trial with two or three instruments of the smallest sizes. Even if the stricture is not passed, it is not an uncommon thing for a small quantity of urine to flow when the catheter is removed, after continued pressure has been made, more especially if the extremity of the instrument entered the stricture at all, and was held there.

Supposing, however, the trial to have been unsuccessful, the hot bath must be resorted to without delay in the manner just described, and the catheter may be again employed while the patient is still in the bath.

Further treatment, if necessary, must depend on the condition of the patient. Generally, it is desirable soon to bring him under the influence of opium, by mouth or by enema, or by subcutaneous injection, after which the catheter is again to be used. Purging is a useful means, but a period of some hours must elapse before it can become available. It is not admissible in weak and broken-down subjects, and interferes with the administration of opium, which is usually a better remedy in these cases. The time which is to be devoted to the employment of all these means must be regulated by the judgment of the surgeon. The condition of the patient, and a knowledge of the time during which absolute retention has existed, will enable him to decide the question of affording relief by some other measures. Generally speaking, however, this is not often necessary. The treatment described will most frequently effect partial, if not complete relief, and render severer operative proceedings unnecessary. But in this, as in other cases, a condition of anæsthesia sometimes facilitates the passing of a catheter in these circumstances, and should always be tried before adopting ulterior measures; indeed, it may often render both opium and the bath unnecessary. By this means spontaneous relief is sometimes brought about; but if not, the patient is spared some pain, especially by being prevented from exerting those involuntary efforts of resistance which are often provoked by the instrument. It is easy to conceive that the muscular relaxation, induced through its agency, may be as available in many cases of retention as it already is in the reduction of dislocations, and of herniæ.

But supposing all our efforts to have been unsuccessful; that the bladder is not relieved; that retention has persisted now for some hours; what is the next course to be adopted?

One thing only remains when all other treatment has failed, viz. to make an artificial opening either into the bladder or the urethra.

It will be almost unnecessary to premise that if, in a fit of straining, the urethra has given way behind the stricture, and urine be extravasated, we need not necessarily make a direct opening into the urethra; the treatment in such a case, however, will engage our consideration hereafter. Again, the retention may depend upon the existence of deep perineal abscess, the possibility of which occurrence should not be forgotten. It is one which should always be closely looked for in all cases of retention from stricture, remembering that the existence of even a considerable collection of this kind by no means invariably gives very marked signs of its presence in the perineum; that its presence must be sought, and that its evacuation by incision may relieve the retention.

Taking it for granted, then, that none of these conditions exist, we have now to inquire what operation shall be performed for the purpose of relieving the patient. The following modes have been pursued:

I. 'FORCING THE STRICTURE' by the catheter.

II. INCISION INTO THE URETHRA, at or behind the seat of stricture.

III. ASPIRATION OF THE BLADDER.

IV. PUNCTURE OF THE BLADDER.

1. By the perineum.
2. By the rectum.
3. Above the pubes.
4. Through the pubic symphysis.

I. With respect to what is called 'FORCING A STRICTURE,' an opinion expressed respecting it must depend on what is intended to be comprehended by the term.

Any proceeding depending alone on the amount of force communicated to a blunt metallic body in the urethra, can of necessity only be described by words in an indefinite manner, as no precise idea can be conveyed to the mind respecting the degree of force which different operators may use, or desire to express by the terms, 'moderate,' 'firm and steady pressure,' &c. If they intend only so much pressure as will dilate the strictured part, and not so much as will tear the canal and make a false passage, it may be taken for granted that ordinary catheterism should include all this, and that it would be extremely fortunate if it never embraced any proceedings of a harsher character. But if forcible catheterism means the determined pushing onwards of an instrument in the presumed direction of the urethra, whether in or out of the canal, until the bladder have been reached, no matter through what tissues the passage be channelled, then the sooner so barbarous a procedure is expunged from the list of surgical operations the more creditable will it be to the art of surgery. Nevertheless, the forcible opening up of a stricture in order to relieve retention was preferred to all other modes by Desault, who gives precise instructions for its performance,[1] and who, during his long experience, only once punctured the bladder; also by Boyer, who especially advocated the use of the 'sonde conique d'argent,' a conical and almost sharp-pointed silver catheter, with a stylet accurately filling its cavity, in performing the operation.[2] Both deprecated the making of false passages, yet used very considerable force, always maintaining the left index finger in the rectum in order to guide the catheter. Roux also, in early life, followed the same practice.[1] However, fresh experience, improved instruments, and chloroform, have happily rendered this method almost obsolete at the present day, and it is dealt with here solely because it has until lately been recognised as a legitimate proceeding by some surgeons.

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[1] *Œuvres Chir. Desault.* Paris. 3rd ed. vol. iii. p. 244. Par Bichat.

[2] *Traité des Mal. Chir.* vol. ix. p. 232. Paris, 1824. This instrument is engraved in *Sketches of the Medical Schools of Paris.* By J. Gross. London, 1815.

**II. Perineal Incisions.**—The next mode is that by which the urethra is laid open from the perineum, just anterior to the anus. There are two methods of doing this. The first, in which a dissection is carried down to the stricture, and through it, if possible, thus making a way into the urethra behind; the other, in which an opening is made directly into the urethra behind the stricture, followed or not by division of the latter, according to the judgment of the operator. The former proceeding, or that of perineal section, has been already fully described at page 175.

The advantage claimed for the adoption of this method is, that it may be made to combine in one operation the relief of the urgent condition and the cure of the stricture. And it is unquestionably an advantage when these results can be attained. It cannot be regarded, however, as an object which is frequently within the reach of the surgeon. Simple as each step of the proceeding appears in words, it is by no means always easily practicable on the patient. The difficulties met with occur, for the most part, in those instances in which the urethra is considerably contracted or tortuous, where the perineum is much thickened and indurated from abscess and fistulæ, as it so often is in old and chronic cases, when any active inflammation of those parts accompanies the retention, and when the constitutional state of the patient is incompatible with the shock of a severe and prolonged operation.

The second method of opening the urethra from the perineum, viz. by an incision made altogether behind the stricture, has been before referred to, as one which has been long resorted to by surgeons for the purpose of relieving retention of urine; the operation indeed generally known abroad as the 'boutonnière.' It was formerly recommended in this country by Mr. Guthrie, and as he gives a practical description of the operation, I shall quote his directions at length:

'The patient being placed as in the operation for the stone, a straight grooved staff or sound is to be passed down to the stricture, and held steadily against it. The rectum having been previously cleared by an enema, the forefinger of the left hand, being duly oiled, is to be introduced into it, and the state of the membranous part of the urethra and the prostate is to be carefully ascertained. The principal object in introducing the forefinger is to ascertain the relative situation of the upper part of the rectum and the urethra, which latter part is only in direct application to the rectum near the termination of its membranous part, and the commencement of its prostatic portion. . . . The surgeon, taking the staff in his right hand, whilst the forefinger is applied to the upper surface of the rectum, moves the point steadily upwards and downwards, so as to convey to the forefinger of the left hand a knowledge of the situation of the extremity of the instrument, and particularly of the distance between them, and which the motions given to the instrument by the right hand will clearly indicate. The thickness of the parts between the obstruction and the rectum can thus be estimated with sufficient accuracy, both at the point where the left forefinger is applied and at the surface of the skin; for although the membranous part of the urethra cannot be easily felt from an incision made on the left side of the perineum, it is distinguished in the plainest manner from the rectum. The next step of the operation is to divide the skin and tissues which intervene between the upper surface of the rectum and the under surface of the anterior and middle portions of the membranous part of the urethra. This is to be done by a straight, blunt-backed, narrow, sharp-pointed bistoury entered a little above the verge of the anus, the cutting edge being upwards, the handle being a little depressed, the point somewhat inclined upwards. The degree of inclination necessary to carry the knife inwards for the distance of an inch, and clear of the rectum, will be indicated by the finger in that part; and the eye of the operator should correspond with the point of the forefinger in the rectum, so that the bistoury may be steadily pressed in to that extent, then carried upwards, and brought out in the exact median line, making an external incision of at least an inch and a half to two inches, or more if necessary, as regards the external parts. . . . The opening will now be sufficiently large to allow the operator to lay aside the knife, and to feel for the urethra with the point of the forefinger of the left hand, keeping the end of the staff steady against the stricture, which will be readily felt, and through which the instrument will now sometimes pass with a little pressure. If it should not do so, the knife is to be resumed, and the forefinger being placed in the wound, on the outside of the rectum, which is to be depressed as much as possible, the back of the knife is then to be turned to it, and whilst the patient strains, the point should open the urethra, which it can do very easily, as far back, if required, as the apex, or transverse portion of the prostate. It will not be necessary, however, to go so far back, and the membranous portion may be opened at its middle or anterior part with perfect safety. A probe should be introduced into it whilst the urine is flowing.' . . .

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[1] *Relation d'un Voyage fait à Londres.* Paris, 1815, p. 315.

'If the operation has been performed for retention of urine, the safety of the sufferer is insured, and nothing more need be done; but as the patient, in submitting to an operation, expects that the original cause should be removed, reference must be had to the stricture, which is, in all probability, half or at least a quarter of an inch distant from and above the opening which has been made to evacuate the urine. The grooved sound or staff, in the anterior part of the passage, is now to be firmly pressed against the stricture, whilst a curved probe or director is, if possible, to be passed upwards, as far as it will go, to meet it. The operator has then the choice of dividing the strictured or obliterated part, upwards or downwards, as he pleases.'[1]

This method is by no means an undesirable one, rarely as it is employed, and if prosecuted with care, and in the manner described, is not very difficult in practice or doubtful in result. The urethra is always free from contraction behind the bulb, and therefore at the point at which it is possible, with due skill, to open it, so that in no case is there any danger of not operating completely behind the stricture.

Sir Charles Bell recommended and practised this operation in those cases in which the urethra was dilated behind the stricture, a condition which his experience led him to believe was more frequent than the converse.[2]

Mr. Liston arrived at a precisely similar conclusion, and describes a similar mode of operating in his work.[3]

**III. Aspiration of the Bladder.**

This is a most useful and easily applicable mode of relieving retention, especially when well-defined distension of the bladder is present. The needle of the aspirator may be employed of so small a calibre, when there is some doubt as to the distension, as to be little more than an exploratory puncture. Reserving, however, all use of this method as a rule to empty only a bladder evidently distended, a respite of a few hours is gained, which is often of great value. When the bladder has been thus emptied of a quantity of urine, and the patient feels the full relief which follows, it is quite possible that the next want to pass water, if not partly met by his own efforts, may be successfully encountered by the catheter; or if not, after one or two succeeding resorts to the aspirator. It is scarcely necessary to describe this well-known instrument, which, however, is more generally available in retention from prostatic enlargement than from stricture of the urethra, and it is named here as one mode of evacuating the bladder which, when feasible, accomplishes the object on very easy terms. The puncture does not injure the peritoneum; at the same time it is invariably to be made in such a situation as to avoid it if possible.

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[1] *Guthrie's Lettsomian Lecture.* London, 1851, pp. 29, 32.

[2] Clinical Lecture, in *Medical Gazette*, Nov. 29, 1834. By Sir C. Bell.

[3] *Practical Surgery*, 4th ed. p. 484.

## IV. Puncture of the Bladder.

This has been performed in four ways: By the Perineum, by the Rectum, above the Pubes, and through the Pubic Symphysis.

1. **The Operation by the Perineum** is now obsolete, and happily so, since it is far more uncertain and dangerous than the others. It was mentioned by Rhazes in the tenth century, and by Serapion also; it was occasionally practised perhaps at that time, although no subsequent record appears of it until the seventeenth century, when the practice of cutting upon the point of a grooved staff, and pushing on a gorget in the presumed direction of the urethra, into the bladder, was substituted by the Dutch and French surgeons.[1] An incision through the integuments was first made directly in front of the anus, or obliquely to the left of it, as in lithotomy, but of less extent; and pressure being made above the pubes by an assistant's hand, in order to steady the bladder and render it tense below, a trocar was thrust in the direction required. It was sometimes introduced by the side of the prostate into the bladder, at other times it was carried through that organ. The tube was afterwards retained in the wound, and the latter was plugged with lint to prevent hæmorrhage. There is no noteworthy account of it as a recognised mode of operating, since the time of Sir A. Cooper, who states it to be 'the most difficult operation of the three,' and advocates the method of opening the urethra behind the stricture, in the median line, an operation which had often enabled him to dispense with that of puncturing the bladder.[2]

2. **The Puncture by the Rectum.**[3]

The present usage is to open the bladder either by the rectum or above the pubes. Each operation has been a favourite one with certain surgeons. An effort was made, about forty years ago, by Mr. Cock, of Guy's Hospital, to test the value of the former method. He embraced every means of studying its capability and results, puncturing the bladder per rectum from twenty-four to thirty times; while he had the opportunity of witnessing the operation, and recording its results in at least a dozen other cases. Carefully considering the body of evidence so collected, Mr. Cock believed the operation to be one fraught with less danger, and to be more easy of performance, than any other which is adopted for the relief of retention.[4]

The chief objections made to it are—the averred liability to the occurrence of abscess between the rectum and the bladder as an after result; the persistence of fistulous opening there; the liability to inflict injury upon the seminal vesicles, leading to inflammation of these and the neighbouring parts, including the testicle; and the danger of perforating the peritoneum with the trocar, and thus setting up inflammation of that membrane. All these results have undoubtedly been met with. One or two instances, perhaps, of each might have been recorded here; I have even known suppuration of the testicle from inflammation to be thus caused. Of all the dangers apprehended, that of wounding the peritoneum appears to be the least likely to happen if ordinary care only be employed. The bladder in rising carries its peritoneal coat along with it; and it has been observed in the examination of those cases where the parts have been preserved after death, that the puncture has almost invariably fallen short of the peritoneal fold, an inch, or an inch and a half. The vesiculæ seminales, or the vas deferens, appear to escape somewhat less frequently. Injury to either of them is a less serious matter than to the former. The operator, however, must carefully endeavour to maintain the middle line in order to avoid them. But Mr. Cock's practice seems to have been remarkably free from these complications, and it is but fair to believe that the dangers of the rectal operation have been overrated. Having carefully examined the reports of forty cases, as given by that gentleman in the paper referred to, I find seven or eight deaths following the operation; but no evidence that these were caused by it. In five cases the patients had suffered from stricture for very many years, and in all of these advanced renal disease existed. In none does it appear to have arisen from any of the causes hitherto alleged to be sources of danger.

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[1] J. Riolanus, *Encheirid. Anat.* Lugd. 1649, Lib. II. chap. xxx. p. 154. Colot, Tolet, Petit, Ledran; quoted at pp. 220, 221. Dionis, *Cours d'Opér.* Paris, 1716, 2nd éd. 3ème démonst. Heister, *Inst. Chirurg.* Amst. 1739, chap. cxliv. sect. ii. pp. 1009–1011.

[2] *Lectures*, edited by Tyrrel. 1825, vol. ii. p. 314.

[3] First practised by Fleurant, a surgeon in Lyons, in 1750

[4] *Med.-Chir. Trans.* vol. xxxv. 1852, p. 153.

Mr. Cock, moreover, states that the result of the operation for retention from stricture is such an improvement in the condition of the urethra, in consequence of the urine having ceased to pass by and irritate it, that the reduction of the stricture by dilatation may be much more readily accomplished than before. When the over-distension of the bladder is relieved, the stricture almost invariably relaxes more or less, and may permit the passage of some urine through it. At all events, if this be not the case, the source of irritation, local and general, having been removed, the stricture will probably become permeable after a few days to a small instrument. This experience of his has been corroborated by that of others, and is such as might naturally be expected to occur.

The mode of performing this operation is as follows: The rectum being emptied by an enema, place the patient on his back in the position for lithotomy, and let him be firmly held by two assistants. Oil and introduce the left forefinger into the rectum, ascertaining the size and situation of the prostate, beyond which the tip of the finger should be fairly carried, so as to define its posterior boundary; not always an easy thing to do when the bladder is much distended, since its neck becomes then considerably elongated. Fluctuation should be felt by it there, communicated, through the contents of the bladder, from a tap made on the hypogastric region, unless the viscus be very contracted indeed, in which case the performance of the operation is of doubtful propriety, since the point of the trocar may enter the opposite coat of the bladder, from absence of the requisite amount of distension, or do some other mischief.[1] Having found the spot beyond the prostate at which fluctuation is most distinctly perceived, and having directed an assistant to support firmly the lower part of the abdomen with both hands, so as to press down and steady the bladder towards the rectum, a well-curved trocar, seven or eight inches long, should be carried along the finger, directed strictly in the middle line to the part indicated, the handle well depressed, and the point carried through the thin coats of the rectum and bladder, when it is felt free in the cavity of the latter. The canula must be carefully kept *in situ*, while the stylet is withdrawn, and afterwards retained there by means of a bandage and tapes.[2] It is desirable to substitute a gum-elastic tube for this as soon as possible, especially if the outlet here is to be maintained for a few days; or, indeed, if only for a shorter period. Mr. R. Davy, of the Westminster Hospital, has contrived a trocar for the express purpose of carrying in such a tube at the time of the operation.[3] The length of time it should be allowed to remain will depend on the amenability of the stricture to treatment. If this yields, the urine will most readily pass through the natural channel, and the opening in the rectum may be permitted to close, a result which quickly follows the removal of the canula. Little fear need be entertained of the continuance of a fistulous opening, for on several occasions on which the canula or elastic tube has escaped by accident, it has been impossible to replace it, and a fresh puncture has been necessary. Even during its term of patency after the canula has been withdrawn, the urine does not continually distil through the opening, but distends the bladder up to a certain point, when contractions of the organ take place, and force it through the artificial opening. So readily indeed do these punctures heal, that it has been suggested by a surgeon, who has himself tapped the bladder several times, and has therefore had some experience of the results, in certain rare cases in which considerable irritation of the bladder is kept up by the continued presence of the canula, to make a fresh puncture every day, in order to avoid it. Whatever may be thought of the proposition, the facts I have stated are an indication that there is little disposition manifested by these openings to take on a fistulous character. It should be added that Mr. Cock states that he has never met with an instance of this—at all events, not of its persistence after the permeability of the urethra had been restored.

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[1] Thus Mr. Cock relates one instance in which he punctured where the fluctuation, although discernible, was evidently small in extent. Only half an ounce of urine escaped at the time. A month after the patient died comatose, and it was discovered that behind the stricture, 'a small part of the membranous and the whole of the prostatic portion of the canal were dilated into a pouch resembling, in size and shape, an elongated hen's egg, and forming a sort of subsidiary anterior bladder. The bladder itself was enormously thickened, and permanently contracted into a ball, presenting no cavity whatever.' The urethra forming the pouch was found to have been transfixed by the trocar, which passed through both its lower and upper walls. (Mr. Cock's cases, No. 40.)

[2] In order to prevent the liability to slip from the bladder which attaches to the old canula, Mr. Cock has contrived one which can be made to expand somewhat after its introduction into the bladder, and with which there is less danger of the occurrence of this accident. He recommends the same form of trocar as that generally used, but 'increased in length and thickness;' with one or two other minor but useful additions. (See *Med.-Chir. Trans.* vol. xxxv. p. 186, and plate.)

[3] *Lancet*, Dec. 4, 1875, a clinical lecture, by Richard Davy, F.R.C.S.

There are certain conditions which must be held to contra-indicate the performance of this operation. The absence of fluctuation when examining the bladder through the rectum, as already noticed: this may be occasioned not only by a contracted bladder, but by a considerably enlarged condition of the prostate, or by tumour connected with it. The incompatibility of the employment of the trocar from the rectum in such cases will be sufficiently obvious.

**3. Puncture of the Bladder above the Pubes** is the next method to be considered.

The mode of performing it is as follows: The patient being placed in a half-sitting, half-reclining position, and the pubes shaved, a vertical incision of the integument is made directly above the symphysis pubis, about an inch in length at the surface; this is to be carried downwards through the linea alba, the fibres of which are divided just enough to admit the tip of the finger to approach the distended bladder. Meantime an assistant, standing behind the patient, should press one of his hands firmly on either side, against the abdominal walls, in such a position as to steady the bladder. A straight or a slightly curved trocar (if the latter, the convexity of the curve should be upwards) is then to be carried with a very little inclination downwards into the bladder. It is better not to empty the viscus immediately, when very large, but to draw off its contents by degrees; as alarming syncope, and even death, have occurred on sudden removal of the pressure from the abdominal circulation. After the operation, the canula should be exchanged for a silver tube, specially adapted to slide through it, secured by tapes and a T bandage, which may remain a variable length of time—at all events until lymph has been effused upon the edges of the wound, when it may be withdrawn, and an elastic gum catheter worn in its place, an instrument which is better tolerated than one made of metal.

**4. Lastly, the Puncture of the Bladder through the Symphysis Pubis** may be briefly mentioned.

This operation was first proposed by Dr. J. M. Brander, of Jersey, in 1825, when a student in Paris,[1] and described in a paper at the Royal Medical and Physical Society of Edinburgh, and at the Medical and Physical Society of Calcutta.[2] Several other cases have been reported.

Dr. Brander directs that the patient should recline, and the trocar should be introduced, with or without a small preliminary division of the integuments, about the centre of the symphysis, reckoning from above downwards, and in a direction at about right angles to the vertical axis of the body. Dr. Brander says, 'somewhat obliquely downward and backward toward the sacrum, varying the direction according to circumstances; a piece of flexible catheter is then to be introduced through the canula,' and retained by a tape.

I once tried it in University College Hospital, and failed to find urine, immediately afterwards puncturing by rectum. The symphysis is, in fact, as in the preceding instance, so completely ossified in most elderly men, that the point of the trocar is blunted by the bone, and does not perforate the soft tissues beyond, pushing them before it, and thus the puncture is rendered nugatory. I have observed this on the dead body when making experiments for the purpose, and shall not repeat the procedure on the living.

In considering these methods of affording relief to the distended bladder in reference to any case which requires an operation, the question to be first solved is the following:

Are the patient's powers and condition such as to compel us to prefer the simplest method of affording immediate relief, without regard to ulterior results? It ought not often to happen that we are called upon to answer this question in the affirmative, if the early treatment have been under our own direction, for it would indicate that other appliances have been too long employed. But then this is not always the case. The surgeon's decision is often required after protracted neglect or mismanagement, and when the patient's powers are at a low ebb. In such circumstances the rectal puncture of the bladder, supposing the prostate not to interfere, a very rare occurrence indeed, is the simplest method, and will afford instantaneous relief, at the smallest possible expense to the patient's powers.

If the bladder is felt on a level with the symphysis pubis, or above it, and mere aspiration is held not to suffice, the supra-pubic puncture offers the most convenient position in which to place an instrument subsequently, which may be retained some days. I have punctured the bladder by that mode and by the rectum seven times only; not once for several years; in four cases only, for existing retention, either from stricture or from prostatic hypertrophy, with false passages. For convenience, especially if it is probable that the wound will require to remain open for some time, I prefer the supra-pubic puncture, and particularly if the patient is not very corpulent.

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[1] *Séances de l'Athénée de Médecine.* 1825.

[2] *Trans.* 1842, vol. viii. Part II. pp. 208–239. A case occurred in 1839, and another in 1841. The first patient died in a few hours, the second in about nine days, after the operation.

In closing this chapter on retention of urine from stricture, which has been discussed at considerable length, let it not be supposed that we should therefore regard it as a condition which very frequently requires either perineal division of the urethra or puncture of the bladder. On the contrary, either operation should very rarely be necessary when the management of the case from the commencement has devolved upon ourselves. If previous neglect or improper interference have existed, the failure of the surgeon who is called in may follow, and he may then be compelled to open a route to the bladder.

I have endeavoured, in the consideration of the subject, to provide as far as possible for contingencies, and have indicated a certain line of treatment for typical cases, as far as such can be delineated. But it cannot be forgotten that every individual case offers a problem by itself, for the solution of which no rules can be positively predetermined, while some cases there are which can be brought under no category, and in which the surgeon must exercise his own independent judgment, and rely upon his own resources.

### Extravasation of Urine from Rupture of the Urethra.

An accident which may take place during unrelieved retention of urine is the giving way of the urethra at some point, and the consequent extravasation of urine into the tissues adjacent. Much more rarely the bladder itself is ruptured. In either case, however, mechanical distension is not the direct, nor the only cause. Ulceration of the mucous membrane behind the stricture, perhaps of some standing, has extended more deeply under the constant influence of irritating urine, and solution of continuity at length becomes complete under the influence of the morbid action and the distension together. The bladder now contracting upon its contents, drives them with great force into the cellular tissue, which readily yields, and from the extensive continuity of passage which exists, the urine rapidly finds its way in the direction by which it is unopposed by fascial partitions, distending the superficial fascia of the scrotum and abdomen, when the rupture occurs anterior to the membranous portion, as before described. The consequences of this are disastrous in the extreme. Inflammation is set up in the track of the noxious fluid, and the areolar connections with the vascular supply of the skin and subjacent tissues are broken up. When this fearful accident happens there have usually been attending circumstances of great neglect, and in which, therefore, the patient is probably seen by a surgeon, for the first time, after the accident has occurred. The general condition of the system is one of extreme depression, and, unless speedy relief be afforded, a fatal result must inevitably and rapidly follow. The phenomena presented by such a case have been fully described in the section relating to symptoms, but the principal local signs are considerable distension of the parts involved, the scrotum being tense, greatly enlarged, sometimes the size of a child's head; the integument is discoloured, the hue varying between dusky red and purple, in addition to which pressure made by means of the finger occasions a kind of emphysematous crackling sensation in the worst portions, from the presence of gaseous products in the interstices of the cellular tissue, that is extremely characteristic. It is a sign of very unpropitious omen if the corpus spongiosum have become infiltrated; a dark spot on the glans penis soon marking its occurrence, and the progress of the gangrene which has resulted. Lastly, the patient is frequently in a state of low muttering delirium, with black tongue, and pulse almost indistinguishable.

In these circumstances it is obvious that no time may be lost. The first object is to prevent further accumulation of urine in the cellular tissues, and provide for its elimination from them by making incisions into the distended parts. To effect this, it is best to make a free incision on each side of the distended scrotum, at least, the same in the body of the penis if it is large and red, with a turgid prepuce probably closing over the glans deeply hidden beneath. If the perineum is full and tense, incision must also be made there; so also over the pubes if dark red tension and swelling have affected that region; in fact, wherever sloughing of the subcutaneous connections is obviously taking place. Fœtid urine, puriform matter, and decomposed tissues come away, and sometimes in surprising quantity. These incisions will not only give vent to the extravasated urine, but provide for its direct passage from the bladder, at first through the tissues, by the opening produced in the giving way of the urethra. Immediate operative measures for the cure of the stricture are not called for, as in the present state of the patient they are neither practicable nor advisable; and, further, it is by no means improbable that when the retention is relieved a catheter may be easily passed into the bladder by the urethra. But there is no occasion to make any attempt to do this until the system has rallied, which it often does to a marvellous extent. In a few hours the sufferer may emerge from a state of utter prostration to one of comparative comfort and promise. Indeed, the symptoms of depression and exhaustion sometimes disappear as by a charm, unless the injury inflicted has been too extensive to admit of repair.

The next point of importance is to support the sinking powers of the patient. The immediate exhibition of nutriment in its most simple, easily assimilated, and yet concentrated form, is necessary, and with this a fair quantity of stimulant may be combined. Strong beef-tea, with the addition of brandy, the mistura vini gallici of the Pharmacopœia, frequently given in small quantities, as the patient can take them, are good forms for the purpose when there is great depression. In general terms, whatever form of nutriment the stomach appears to be most likely to bear, and is also the most agreeable to the patient, is probably in such circumstances the most desirable to administer. In most cases, also, the application of artificial warmth to the extremities will assist in bringing about the favourable issue.

The free use of cinchona in some of its forms is sometimes indicated. The chlorate of potash in doses of six to eight grains, in an ounce or two of well-made decoction of the red bark, and a couple of drachms of the tincture, may be given every three, four, or six hours with great advantage, if it can be borne. Ammonia, for a short time, appears to be sometimes serviceable. In other cases, especially where symptoms of nervous excitement appear, with extreme debility, the use of opium may be attended with the best results.

However favourably the patient progresses, a considerable amount of sloughing must often be anticipated. The connections of the skin with the tissues beneath having been destroyed, the nutritious supply is cut off, and its death follows as the necessary consequence. This is commonly the case with that of the scrotum to a greater or less extent. Both the testicles are sometimes completely stripped of their covering, and are seen bare in the wound, and even hanging by the cord. During this process the removal of the products of decomposition and the cleanliness of the parts must be provided for. Antiseptics and disinfectants are to be freely used as local applicants and to purify the atmosphere.

If the extravasation have taken place between the two layers of the deep perineal fascia, a firm, hard, and deep-seated swelling may sometimes, but not always, be detected in the perineum. This is to be at once freely opened. If it occur behind the fascia altogether, but this is very rare, the urine finds its way upwards around the base of the bladder, and a fatal result is inevitable.

The most certainly fatal accident that can happen is RUPTURE OF THE BLADDER itself. This occurs by a process of the same nature as that which has already been described as affecting the urethra—that is to say, by slow degradation and ulceration of tissue, although it may not always occur in the bladder, properly speaking, but in a thin and dilated sacculus springing from it. Occasionally the discharge of its contents takes place directly into the peritoneal cavity, more commonly into the cellular connections of the organ below the line of its peritoneal coat, after which it may secondarily escape through the peritoneum or not. In any case, in the circumstances here described, a recovery has never been known to happen, and cannot be regarded as possible.

The symptoms of vesical rupture take place after a prolonged but not necessarily absolute retention, for some surplus of urine may have been previously escaping by the urethra. The patient usually states that he has felt something give way. Acute abdominal pain then sets in; the belly becomes exceedingly tender and distended; the features are pinched and anxious; the breathing hurried; obstinate hiccough occurs, sometimes vomiting; the pulse is sharp, quick, and irregular; urine ceases to flow altogether, as also does the straining to void it. General fluctuation may be sometimes found in the abdomen, and inordinate distension of the bladder, before felt in the rectum beyond the prostate, has now disappeared. Sometimes the patient is delirious, and even maniacal. And after a period varying from thirty-six hours to four or five days from the time of the accident, during which the patient's agonies are extreme, death takes place. This outline of symptoms is founded upon the only reported histories of this condition which I have met with, two being by Sir Everard Home. Many times a rupture of the bladder has occurred from violence, which is a wholly different matter.

**Treatment.**—The indications which, in the absence of experience, we should endeavour to fulfil, would be as follows: To provide for the free exit of the urine from the bladder by puncture; to alleviate suffering by large doses of opium, and hot fomentations and rubefacients to the abdomen; to abstain from depressing treatment, as general bleeding, which can be of no service in relation to the peritoneal inflammation as long as the exciting cause remains. Whether an attempt to remove this, in case of extravasation into the abdominal cavity, by puncture of its walls, should ever be entertained, could only be determined by a knowledge of the individual circumstances of the patient. Such a proceeding affords the only chance (exceedingly slender as it is) of recovery which surgical aid could afford.

## CHAPTER XII.

### URINARY ABSCESS AND URINARY FISTULÆ.

THE local consequences and complications of long-standing or neglected stricture of the urethra will now engage our attention.

**Urinary Abscess**, most frequently situated in the perineum, sometimes in proximity with the anterior part of the canal, is a frequent concomitant of organic stricture. Its pathology has already been considered. We may meet with it in two conditions; as inflammatory or acute, and as cold or chronic.

In either case it is a circumstance of serious import: the former kind often requiring prompt and decisive interference on the part of the surgeon. Generally speaking, its presence is indicated by constitutional symptoms before local evidence appears of a marked character. Suspicion that matter is forming in a deeply seated spot may be aroused when a patient, the subject of confirmed stricture, is attacked with severe pain about the neck of the bladder and perineum, with a sense of weight, heat, and throbbing about the parts; the stream of urine notably decreasing in size; these conditions being accompanied by shivering, nausea, furred tongue, flushed face, sharp quick pulse, and other symptoms of fever, although all the local signs discovered by an examination of the perineum are some slight swelling and tension there. The degree and situation of tenderness on pressure will help to point out the site of the affection. If a comparatively superficial swelling is presented, inclining to either side, and somewhat forward, it may be situated in the fascial connections of the corpora cavernosa. But if there be rather a general heat and fulness of the whole perineum, it is more probably confined beneath the deep fascia, a not unusual place for such collections. Under these circumstances, if the patient's symptoms are urgent, an incision should be made in the middle line of the perineum, just in front of the anus, to a depth which will vary from an inch to an inch and a half, according to the condition of the parts, as no benefit can be anticipated from a mere division of the skin. In any case no harm will be done, although nothing else result but a little bleeding, and the relief of tension. The issue of matter in any quantity, however small, is of course satisfactory, and its free exit must be secured by providing an external opening in a depending position, and sufficiently long to insure this. Otherwise it may burrow widely or irregularly, instead of being evacuated. No considerable hæmorrhage is to be expected, if due regard have been paid to the situation of the main arterial trunks; although sometimes, especially when there has been much inflammation and induration in the part, considerable oozing may continue for some time. When it has ceased, a poultice should be applied to the wound. A surprising improvement in the patient's condition often takes place almost immediately; the fever subsides, and the constitutional symptoms may rapidly disappear.

The importance of speedily evacuating such collections of matter, even at the very commencement of their formation, cannot be overrated. It is often no easy matter to determine the presence of deeply seated abscess, and we are not warranted in requiring absolute evidence of the fact before making the incisions described. Matter pent up behind the deep perineal fascia which forms a partition too dense to be penetrated by the action of absorption will find its way into the cellular tissue of the pelvis, by the side of the bladder, between it and the rectum, and give rise to most dangerous if not fatal consequences, or, in event of recovery, to urethro-rectal or vesico-rectal fistulæ. Sometimes it may burst into the urethra and be discharged by the external meatus, which is on the whole a fortunate course for the patient.

**Urinary Fistulæ: Varieties.**

When urinary abscess originates anteriorly to the deep perineal fascia, its more common situation, there is less constitutional disturbance, the matter points more readily, and the signs of its presence are soon sufficiently obvious. The surgeon should make a free incision as soon as he is satisfied as to the nature of the swelling, when pus in some quantity escapes, usually alone, sometimes mixed with urine, but not necessarily so. More generally the urethral membrane, which has presented but a thin barrier between it and the stream of urine, gives way in a day or two, and the urine appears then for the first time. But one of the objects to be attained by making an early opening into a collection of matter in the perineum, is to prevent the occurrence of any lesion of the urethral walls. If the evacuation of matter is soon and fully insured, we may hope to find the cavity gradually closing, and that no urine will penetrate it. This having been accomplished, there is less fear of its remaining open for a long period, or of its becoming an abnormal passage for the exit of the urine. If, on the other hand, the incision has been delayed, and when also, as often happens, the abscess runs a chronic course, a urethral communication is almost certain to be established sooner or later. In the latter case it is equally desirable that the matter should be evacuated as soon as its presence is observed. An unnatural opening, however, having been established, the frequent passage of the urine through it prevents its closure, and this will inevitably occur at each act of micturition if the stricture be narrow. This artificial canal, usually termed urinary fistula, is one of the commonest accompaniments of neglected stricture, and forms often one of its most troublesome complications.

**Urinary Fistulæ.**—The external openings of these passages are most commonly to be seen at the surface of the perineum and scrotum, which parts are traversed by them in various, and often by circuitous routes; less frequently they are observed in the groins, the upper part of the thighs, the adjacent part of the nates, or even above the pubic symphysis. In the last-named situation, the devious channel usually results from incisions originally made to relieve extensive extravasation of urine, and which have never healed; but in the scrotum or perineum the existence of an abnormal outlet is generally due to a previously existing urinary abscess.

Under the familiar term of urinary fistulæ all these conditions are commonly included; some of them simple, and easily amenable to treatment; others complicated, and requiring much time, care, and perseverance, in order to attain a successful result. Some are merely narrow channels through nearly healthy parts; others pass through structures greatly indurated, augmented in size and density by repeated deposits of plastic matter, and therefore more or less deformed; sometimes the fistulous tracts are connected with cavities secreting pus and detaining in their interior some quantity of the urinary secretion. The external orifices of the fistulous passage may be few or numerous; in the latter case being the outlets of sinuous and branching channels springing in process of time from the original track, and giving exit to a number of small streams when the act of micturition is performed. Lastly, there is a class of unnatural passages or openings into the urethra, which have their origin in loss of substance by sloughing from extravasation, or phagedænic ulceration, or as the consequence of violent injury to the parts; and these abnormal conditions are quite distinct in character, results, and in relation to the treatment required, from the two preceding classes.

The mode of arranging and separating the numerous and widely differing lesions comprehended under the general term urinary fistulæ, which is thus indicated, is simple, accurate, and desirable to be recognised in dealing with the subject. It comprehends three very distinct typical forms of morbid condition, each requiring a method of treatment equally distinct in order to be appropriate.

**1. Simple Fistulæ.**—The first class embraces those cases where, in connection with stricture of the urethra, one or more fistulous passages exist, by which the urine traverses the perineum or scrotum, the surrounding parts being not much altered from their natural or healthy condition. In this category may be classed most of the cases ordinarily met with. These openings must be regarded as the result of Nature's mode of affording relief in cases of narrow stricture—in other words, as safety-valves to the dangerous pressure which is being exerted upon important organs behind the obstructed point; as—while they nevertheless form fresh complications of the original complaint—most effective guarantees against those more dangerous consequences which would otherwise threaten in the absence of surgical aid, such as actual retention of urine threatening life, or chronic inflammation and induration and infiltration of the perineum and adjoining parts, or dilatation of the bladder, of the ureter, or even, at last, organic changes in the kidneys themselves. Thus we may often see patients with large fistulous passages in the perineum giving exit to all their urine, enjoying extremely good health for years together. But the excessive annoyance, sometimes the pain, besides the tendency to grow worse, which, even in these exceptionally favourable cases, are necessarily present in connection with urinary fistula, to say nothing of considerations arising in relation to the sexual function, demand the interference of the surgeon to restore the natural state.

**Treatment.**—With regard to the large class which we are considering, as a rule, nothing else is required than to dilate fully the urethra. The urine will flow by the natural channel, and the fistulæ will heal of themselves, if the urethra is dilated so as always to transmit a full and free stream. There need be no special treatment of the fistulæ; the less they are touched the better. Their disappearance is almost certain if the urethra is maintained in such a condition that a No. 10 or 11 catheter passes easily into the bladder. This is a proposition which may be regarded as fully established. Those patients who form the exceptional instances to this rule are for the most part weak in constitution, have little reparative power, or are the subjects of some chronic disease in addition to stricture of the urethra. The management of such may be conveniently considered with the next class, viz.:

2. **Fistulæ with Induration.**—Those cases in which the fistulæ pass through tissues which are more or less indurated and deformed by repeated deposits of inflammatory exudation; such being often connected in some part of their course with cavities, the sacs of former abscesses secreting thin or sanious pus.

**Treatment.**—In these instances, also, the primary object must be to dilate adequately the stricture, and to observe the effect induced, for even some of these cases may heal, when this initial and essential condition has been established, although the rate of progress may not be rapid. If, however, dilatation has been made and maintained for some time, and little or no benefit has resulted in the condition of the fistulæ, there are two courses open, one or other of which should be adopted; the first is to stimulate the walls of the fistulæ themselves, and so bring about adhesion of opposing surfaces; the second, to lay them open, in order to produce recent and healthy wounds, so that they may heal up soundly from the bottom. But associated with such treatment, it is of importance to attend to the patient's general health, seeking to maintain the secretions and excretions in a natural condition.

Various agents have been employed for the accomplishment of the local measures first named. One is the concentrated tincture of cantharides, applied on a camel's-hair brush, or on a probe armed with lint, or a fine syringe. Solutions of the sulphate of zinc or copper, and of the nitrate of silver, have been introduced by means of a syringe, sometimes with apparently good result. One of the best modes we can employ is to introduce carefully, as far as it is possible, a small and flexible silver probe, coated with nitrate of silver. This may be easily done in the following manner: A small quantity of nitrate of silver is to be melted in a test tube or watch-glass, over a lamp, and about a half or three-quarters of an inch of the extremity of the probe immersed in the boiling fluid; while there, it is to be turned round on its axis, and the lamp removed, when, as the temperature decreases, a thin coating of the caustic will take place upon the instrument. The probe, thus armed, must be carried quickly up the fistulous sinus, a plain probe having been introduced immediately beforehand as a guide to the length and direction of the passage. It often happens that the external orifice of the sinus is smaller than any other part of it. It is advisable in such a case to apply a little caustic potash, for the purpose of enlarging it, and so facilitating the removal of the discharge, which is essential to success.

The application of compression to the fistulæ has been tried several times, and success has been claimed for it in two or three cases. M. Diday, of Lyons, formerly communicated a case at some length to the Société de Chirurgie of Paris, in which he states that he obtained a successful result, all ordinary means having failed, by making the patient apply firmly to the perineum an india-rubber ball, inflated with air, on every occasion before making water, and for some minutes afterwards. This plan was studiously followed during fifteen days, when the opening had soundly cicatrised. Four months after the patient was perfectly well.[1]

The cure of obstinate urinary fistula has often been attempted by introducing a catheter, and permitting it to remain in the urethra for days together, on the principle of insuring, as it has been supposed, the passage of the urine through the instrument, and thus preserving the fistulous passage from irritation. The object proposed is not thus easily accomplished; for experience shows, that however large the instrument may be, and however closely it may fit the urethra at the present moment, before twenty-four or thirty-six hours have elapsed it will lie loosely in the canal, and urine will pass by its side. It is not possible, in fact, to remove urine from the bladder, and at the same time to avoid contact between the fluid and the urethra, for any lengthened period, by this means. But, further, if the attempt to maintain the urethra constantly distended, by substituting an instrument of larger size as soon as the inlying catheter is inadequate to fill it, be persevered in, a likely result will be ulceration of some part of the urethral walls, a condition which will not aid much to produce any healing of the fistulæ associated with it. I have seen this accident so produced, the occurrence becoming obvious in the formation of a fresh fistula anterior to the scrotum, where the urethra coverings are thin, purely from an unsuccessful attempt to maintain the bladder empty, and prevent the urine from coming into contact with the urethra by the method described. The passage of urine by the side of an instrument is due, as I have had frequent opportunities of observing, when maintaining catheters in the bladder for the treatment of narrow stricture, to an action which it is impossible to prevent in these circumstances, viz. that of capillary attraction. As soon as there is a slight interval of space between the catheter and the walls of the urethra, some little urine will now and then drain off, in obedience to the law referred to. The mode of treatment, therefore, which consists in tying in a catheter, is to be regarded as inadequate to the cure of fistula, except so far as it produces dilatation; and it is one which has obtained countenance chiefly from the plausibility of a theory which is certainly unsupported in practice.

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[1] *Bull. de la Soc.* vol. v., 1855, p. 45.

Heister recommended compression for these cases also, by means of the truss or 'yoke' invented by Nuck for incontinence of urine. *Institutiones Chir.* Amst. 1739, cap. 145. Nuck's instrument is engraved in his *Observationes*, fig. 11 p. 139. Lugd. 1696.

A far better method than the preceding is to withdraw all the patient's urine by introducing a catheter four or five times a day, or as often as may be necessary to evacuate the bladder entirely by artificial means, and permit none to issue naturally through the urethra. Acting on this principle, I have now adopted, for almost all cases of fistulæ which continue patent, after complete dilatation of the urethra has been made, the plan of teaching the patient to pass his own catheter, and to do so every time he requires to pass water, night and day, for some weeks. The success of this practice has been remarkable; so much so, that it is very rare to require any other. A patient is easily taught in a few lessons to become master of a flexible instrument of any kind which he can manage best; and promising faithfully on no occasion to permit himself to perform the act of micturition voluntarily, he finds in a few days great improvement in the condition of the fistula. He is admonished always to employ his catheter immediately before any action of the bowels, so as to insure, as far as possible, that no urine traverses the canal at that time. It rarely happens that his object is not almost attained at the end of four or five weeks; but it is advisable to continue the process a week or two after the openings appear to be healed. I cannot speak in terms of too great satisfaction of the success which has followed this very simple treatment. It has the advantage moreover of not confining the subject of it to his room or to his house.

In reference to operative proceedings by the knife, it has been the custom sometimes to make free incisions in the perineum, involving the fistulous passages, down to the urethra, or nearly so, in order to obtain a healthy granulation, and sound healing from the bottom of the wound. In some cases in which external division of the stricture on a grooved staff is indicated, this operation may be performed in such a manner as to include the fistulous opening in the incision, in which case a successful result may generally be reckoned on. Whether or no, free incisions carried through the fistulous tracks generally aid in insuring the free discharge of matter confined within cavities, which, so long as they exist, prevent reparative action in the tissues.

For almost two centuries it has been the practice amongst surgeons, especially in France, to make an opening in the perineum upon a grooved staff (boutonnière), in order to give issue to the urine, for various purposes in connection with diseased bladder and urethra. The irritating fluid being thus withdrawn by a short route, the parts anterior to it were relieved from its injurious influence, and were observed to acquire a healthier condition. (See p. 171.) Much more recently the puncture of the bladder by the rectum has been practised with a similar result, more especially where an unusually narrow or irritable stricture has existed with numerous fistulæ. (P. 197.) The principle upon which these methods of proceeding have been serviceable, is that of removing all sources of irritation, but particularly the constant passing of acrid urine through both the urethra and the unnatural channels which had hitherto given exit to it. The precise mode in which it should be made applicable must be determined according to the individual requirements of each particular case. The instances, however, in which such measures are necessary must be looked upon as of rare occurrence.

An obstinate species of fistulous opening, communicating with the prostatic part of the urethra, is that which in a few exceptional cases follows the operation of lithotomy. The introduction of the heated galvanic wire is one of the best means of obliterating it.

A fistulous passage is sometimes prevented from closing by the presence of a small calculus in some part of its course. This may occur either by the lodgment of some small concretion which has escaped from the bladder, or from the deposit and production of such a formation from unhealthy urine while passing through the sinus. Such calculi have sometimes been discharged through such passages, or have been removed artificially by enlarging them, and extracting the obstructing bodies in question. Fistulæ associated with the prostate occasionally exist, either with or without calculous formation; sometimes connected with prostatic abscess, and are generally exceedingly obstinate and irremediable.

Fistula is not necessarily a complete or continuous passage from the urethra to some other surface; it may have an opening at one end only, and have a blind or cæcal extremity for the other. Hence 'blind urinary fistula' has been described. A small tumour, originally formed by a collection of matter, with thickened walls, and having a communication with the urethra, constitutes the general form. Its origin has been variously accounted for. Some observers connect it with stricture; others with inflammation of the mucous follicles of the urethra. Sir B. Brodie takes the latter view. Sir Charles Bell attributed it to inflammation and suppuration of Cowper's gland when situated close to the bulb. A firm small swelling is felt externally, usually in the anterior portion of the penis, and connected with its inferior surface, and the contents are sometimes to be evacuated into the urethra by pressure. Ordinarily, there is more or less constant oozing of these from the meatus, giving rise to a discharge.

This will not disappear until the tumour is opened externally, when it becomes a fistula of the ordinary kind, requiring treatment already indicated.

Urethro-rectal fistulæ sometimes occur as a consequence of stricture and abscess, and more rarely, perhaps, vesico-rectal. In either case their existence may be announced by the appearance of feculent matter by the external meatus, or of a stain communicated to the urine. The escape of gas also is occasionally perceived through the urethra. Sometimes the patient notices the passage of liquid in an unusual manner and quantity by the anus, and that habitually, while a diminished quantity of urine is observed to come by the urethra; this is perhaps the more usual result of urethro-rectal stricture.

It is not an easy matter to close these openings, unless of very small size; but the actual cautery, and particularly that heated by the galvanic current, affords the best chance of success. It may be applied through the rectum, the duck-bill or vaginal speculum having been first introduced, and a full-sized sound carried into the bladder, to bring the opening into full view. On the day before the operation the bowels are to be purged and cleared by an enema an hour or two before the application of the cautery, after which they must be prevented from acting for two or three days. The cautery is to be reapplied two or three times at intervals of about ten days, if necessary. In one case of this kind I obtained a cure by making a patient pass water only in the prone position of the body for several weeks. In others I have adopted the systematic catheterism just referred to, and have found it, associated with the galvanic wire, the most successful method.

When the opening has been too large to be narrowed by the cautery, one may try to do an operation analogous to that adopted for vesico-vaginal fistulæ. I have never cured, but I have improved a case by this method; it is very difficult to do in the confined space offered by the rectum, still it is sometimes possible. Special instruments must be employed for the purpose, and these sometimes require to be slightly modified in size or form for individual cases.

**3. Fistulæ with Loss of Substance.**—This class of urinary fistulæ comprehends those cases in which unnatural openings into the urethra exist, not necessarily depending, like those belonging to the preceding classes, upon obstruction of the canal, but upon actual destruction of the walls of the urethra and superjacent parts. The common causes of such lesions are sloughing from extravasation of urine, simple and phagedænic ulceration, and mechanical injuries of various kinds.

These openings are for the most part larger, although not invariably so, than any of those already referred to. Generally a portion of the floor of the urethra is destroyed, as well as the structures which have intervened between it and the external surface, so that in many cases more or less of the mucous membrane of the upper aspect of the canal is visible from the outer orifice. As a consequence the whole, or nearly the whole, of the urine passes by the artificial channel in a full stream. Such abnormal apertures may be regarded, for practical purposes, as naturally arranging themselves into two distinct divisions, viz.:

(*a*) Those which exist before the scrotum, or in the penile portion of the urethra, sometimes called ante-scrotal or urethro-penal fistulæ; and

(*b*) Those which are found in or behind the scrotum, known simply as scrotal and perineal fistulæ.

A broad distinction exists between the cases of each division in relation to their amenability to treatment, and to the nature of the operative measures which must be undertaken with a view to their cure. Ante-scrotal urethral openings are the most difficult to close. The coverings of the urethra here are thin, often insufficient to close by the healing process any but the most insignificant aperture. For the same reason it is difficult to obtain from their immediate neighbourhood a flap endowed with sufficient vitality to preserve its existence after transplantation. And further, owing to the extreme mobility of the member, it is difficult to maintain that perfect steadiness of position so desirable in a part which is the subject of an autoplastic operation; while the alteration in size and form which the organ is liable to exhibit, may impair, or sometimes render impossible, the success of the best-planned and most skilfully executed operation. Nevertheless, with all these difficulties, in addition to that formidable one, the contact of the urine before referred to, such openings, even when large, are not now by any means to be regarded as beyond the reach of surgical skill. The exercise of considerable tact, ingenuity, patience, and unremitting attention is indispensable on the part of the surgeon who undertakes to treat a case of penile fistula, requiring a plastic procedure for its cure; and some little resolution, with a good stock of patience, may be equally necessary on the part of the patient.

Openings in the perineum, involving loss of substance, on the contrary, although by no means easy to close, are remediable with less difficulty than those in the anterior part of the canal, on account of the absence of conditions which have been just adverted to, as constituting the more prominent obstacles in respect of that class.

It is only within the last few years that these distressing lesions have been rendered amenable to surgical treatment. Formerly they were regarded as amongst the opprobria of our art, and were abandoned as beyond its power. Generally speaking, some operative measure, which has for its object the transplantation of a flap of the neighbouring integuments to supply the loss of tissue at the opening, is necessary.

In a few instances, however, where the openings are small—cases, by the way, which are rare—this proceeding has been dispensed with, and their complete closure has been accomplished by other means.

**Treatment.**—First, ante-scrotal fistulous openings which are of small size, but obviously depending upon loss of substance in some degree, have been closed by repeated applications of a caustic agent to their edges and to the surrounding parts. Sir A. Cooper records a case in his 'Surgical Essays,' in which he closed a fistulous opening of the size of a pea, and situated immediately in front of the scrotum, after the failure of two operations by the hare-lip and interrupted sutures, by the application of nitric acid 'to the edge of the fistulous orifice and upon the skin, to the extent of three-quarters of an inch around it.' The process was repeated several times within the course of six or eight months, when the orifice was perfectly closed. Sir A. Cooper observes on this fact: 'But still it is only in cases in which the skin is very loose, or the scrotum is forming a part of the fistulous orifice, that this plan would succeed, as, where the skin is tight, it would be scarcely possible to draw it together so as to produce its union.'[1]

In the same manner the nitrate of silver, or tincture of cantharides, rendered stronger than usual by evaporation, has been successfully employed in very small openings. Dieffenbach was in the habit of employing the latter agent in the following manner: Having passed a full-sized bougie into the canal, he introduced a camel's-hair pencil dipped in the tincture referred to, and thoroughly applied it to the inner border of the opening. He repeated this three or four times in the course of twenty-four hours, and at the end of that time scraped out the loose cuticle raised by the blistering fluid. Action was excited on the raw surface by another application, and this process was repeated until the granulations were healthy, and bid fair to close the aperture. He tried on several occasions the introduction of a hare-lip pin, and also a single point of interrupted suture, after thus making raw or 'reviving' the lining of the fistulous opening, but without success. The use of the irritant agent uncomplicated with the suture gave generally a better result. Subsequently he contrived a suture which produced more successful results than any such method previously employed, to which he gave the name of 'the lace suture'[2] (Schnürnaht).

He describes it as applicable to small fistulæ in the anterior part of the canal, and when the surrounding skin is supple and healthy. The margin of the unnatural opening, as well as the surrounding skin for a short distance, must be frequently touched during the day previous to the operation with the concentrated tincture of cantharides. Before proceeding to use the suture, the loose epidermis raised by the blistering fluid is to be removed by scraping, a sound introduced into the urethra, and made to pass below the opening. The operator is then directed to take 'a small curved needle, sharp at the point, but not at its edges, with a stout silk waxed thread, and by means of a needle-holder to introduce it beneath the skin at about three lines from the border of the fistula.' The point of the needle is to be carried deeply, but not into the urethra, and made to emerge at another point, about three lines from the margin of the fistulous opening. By three or four of these stitches, the thread is to be carried round the opening, until it finally emerges at the point at which the needle was originally entered. The thread, therefore, now lies deeply in the cellular tissue around the fistula, at about three or four lines' distance from it. (See figs. 65 and 66.)

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[1] *Surgical Essays*. By A. Cooper, F.R.S. London, 1819, pp. 205, 206.

[2] Dieffenbach's description of this was originally published in Dr. Oppenheim's Journal at Hamburgh, 'On New Methods of Cure in Cases of Unnatural Openings in the Anterior Portion of the Male Urethra.' This was translated by Mr. Swift for the *Dublin Journal*, No. xxix. vol. x. 1836. Dieffenbach subsequently illustrated the subject in his work, *Die Operative Chirurgie*, von Johann Friedrich Dieffenbach. Leipzig, 1845, vol. i. p. 529.

The two ends are then to be drawn together gently and slowly, so as to tighten the thread, and gradually approximate the borders of the fistulous orifice until it is obliterated. Lastly, the ends are to be fastened by a knot, which, when fastened, sinks into the cellular tissue, and disappears. A piece of wet lint is to be applied to the part, the sound withdrawn, and the patient directed to pass urine, when requiring to do so, by the natural passage. In three or four days, the ligature may be divided and drawn away. 'Even,' says Dieffenbach, 'if the first application does not quite close the opening, this is rendered smaller, and the succeeding operation is easy, and certain to succeed.'

FIG. 65.

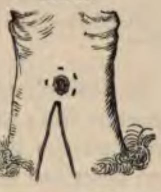

FIG. 66.

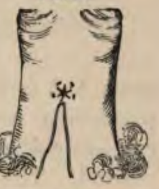

FIG. 65.—Dieffenbach's 'lace suture.' The thread encircles the fistulous opening; its two ends are seen issuing from the point at which the needle was first introduced.

FIG. 66.—The suture tied, and the opening closed. The knot uniting the two ends of thread sinks deeply into the cellular tissue, and is, therefore, not seen.

**Urethroplasty.**—When the opening is too large for such treatment, it is generally necessary to resort to some plastic procedure for its cure. Such operations are comparatively of recent date, the first on record, which I have been able to discover, being one designed and successfully performed by Sir A. Cooper in 1818. A man, æt. 56, had an ante-scrotal opening, half an inch in length; the margins of this were pared, and a flap was dissected from the scrotum, leaving a broad attachment. It was kept in place by four sutures and by plaister. Adhesion was ultimately perfect.[1] Another case followed in the practice of Mr. Earle, of Bartholomew's, in 1819. Here the opening was perineal; the first operation failed, but the second, also by flap, in the following year completely succeeded.[1] In these two cases the plans of proceeding were totally different: in them we have not only the germs, but, to a great extent, the development of those modes of operation since adopted elsewhere.

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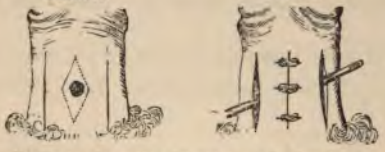
[1] *Surgical Essays.* By A. Cooper. London, 1819, Part II. p. 207.

In dealing with the ante-scrotal fistulæ which were too large to be remedied by the 'lace suture'—that is to say, such, for example, as would permit the introduction of a full-sized catheter—Dieffenbach proceeded as follows.

A large catheter having been introduced into the bladder, the rounded orifice of the fistula is converted into a lozenge-shaped one by the removal of a small piece of skin above and below it, as indicated in fig. 67 by dotted lines. A longitudinal incision through the skin was then made on each side, at the distance of about half an inch, or a little more. The point of a fine scalpel is next to be carefully carried by successive strokes, beneath the skin which intervenes between the two incisions, so as to detach it from the subjacent parts, and form what Dieffenbach called 'a bridge,' for the purpose of permitting urine to escape from the fistulous opening at the lower extremity of either incision: the borders of the fistula are also to be revived. The condition described is indicated by the probe seen to be passed beneath the skin at fig. 68.

FIG. 67. FIG. 68.



Dieffenbach's method by 'lateral bridges' and twisted sutures.

Although sometimes failing, this method may be regarded as affording a fair chance of success, provided that the aperture is not too large. It is based, as will be observed, upon the principle of bringing into contact, *not mere edges of thin tissue*, the adhesion of which cannot be expected to take place, but broad surfaces freshly revived, and maintained in apposition by light compression. It may be laid down, however, as a general rule, that success is not to be expected by this operation if applied to openings that measure more than the third of an inch in any direction.[2]

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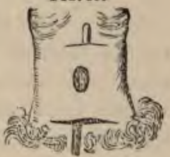
[1] *Practical Observations on Surgery.* By H. Earle. London, 1823. Roux and Jobert, nevertheless, claimed for France the first employment of these two proceedings, on the ground of operations performed many years subsequently to those named in the text. They are, on this account, specially referred to there.—*Traité de Chir. Plast. par A. J. Jobert (de Lamballe)*, tom. ii. pp. 136, 149. Paris, 1849; *Quarante Années de Prat. Chir.; Ph. J. Roux*, tom. i. p. 56. Paris, 1854.

A much older French work accords priority to Cooper and Earle.—*Autoplastie, par Ph. Fréd. Blandin.* Paris, 1836, p. 75.

[2] A method adopted by M. Alliot, of Montagny, in the year 1833, for closing an

A slight modification of Dieffenbach's plan was practised by Nélaton of Paris, which consists in making the outlying incisions above and below the fistula, instead of laterally, as recommended by Dieffenbach. It is supposed that this affords a still better chance of permitting the free escape of urine.[1] The upper and lower incisions should be distant each about an inch from the fistulous opening, and the skin should be completely detached from the subjacent connections, commencing at the borders of the fistula, the dissection being carried up to the incisions as well as in a lateral direction. (See fig. 69.) Again, since the use of the twisted suture is sometimes attended with gangrene of the skin included in it, and the operation becomes sometimes thus defeated, it is proposed not to close the opening by any suture at all, but to permit it to contract by itself, at all events for a few days, when one or two pins at most will bring together the granulating surfaces, and enable union, in a few hours, to take place. A case by M. A. Richard is recorded in the journal named below, in which the last-mentioned plan of proceeding was successful.

FIG. 69.



Nélaton's modification in the situation the incisions.

Dieffenbach employed another method for the closure of openings, similar to the last-mentioned. By this method, the skin, instead of being moved transversely from the sides of the penis, is moved upwards from the scrotum. A catheter having been introduced into the bladder, the fistulous opening is included between two elliptical lines of incision, passing in a transverse direction, one above, the other below it. The surface so marked out, and with it the borders of the opening, are then to be lightly pared. (Fig. 70, *a a.*) Next, another transverse incision, of about two inches in length, is to be carried through the skin at the root of the penis—that is, at about an inch beneath the lowest elliptical incision and parallel to it (indicated by a straight line at *b*). The bridge of skin thus formed is to be carefully

FIG. 70. FIG. 71.

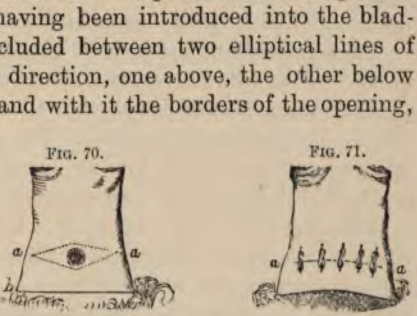


FIG. 70, commencement, and FIG. 71, completion, of Dieffenbach's operation by transverse incisions.

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ante-scrotal fistula of moderate size, was successful, and differed in some respects from any which had been previously employed. It consists in forming a flap from the skin on one side of the fistulous opening, in drawing it over, and in adapting it, not upon the opening itself, but to a raw surface previously made to receive it upon *the other side.* Thus the fistula is covered in by the base of the flap, whilst the greater part of the uniting surfaces is not in the track of the urethra, but on the other side of it. This case is detailed at length in the *Gazette Médicale de Paris*, 1834, p. 348.

[1] The first account of this method appears in the *Gazette des Hôpitaux* of August 10, 1852; but a fuller description and a case by M. Richard are given in the same journal for March 28, 1854.

dissected up from its cellular connections. The bridge being now movable, is drawn up so that its superior border comes into contact with the line of skin marked by the upper elliptical incision, and maintained there by five or six fine hare-lip pins and twisted sutures. (Fig. 71, *a a.*) A raw surface is left below.

In cases where the deficiency was more considerable, Dieffenbach proposed, after making the 'lateral bridges' before described, but more extended, and placed farther apart in proportion to the size of the opening, to bring together the borders of the fistulous orifice in the skin, not with a few points of twisted suture, but with lateral leather splints. For this purpose, two strips of leather are prepared, about three lines broad, and rather longer than the opening to be closed, each perforated by three small holes, to permit a suture to be passed through. These are to be applied laterally to the two borders, previously raised and placed with their raw surfaces in contact, and the needles are to be passed through the holes in the splints and the two layers of skin together, so as to insure perfect approximation and the contact of considerable planes of surface for adhesion. The author states that he has not yet made trial of this suggestion, but a precisely similar plan has been pursued by Mr. Le Gros Clark, in our own country, with whom the idea appears to have been perfectly original. In his case there was a very large ante-scrotal fistula, and the result was perfectly successful.[1]

An improved application of this principle would be the use of one or two silver plates, corresponding in form with the surface of the penis or scrotum, and bored with three or more holes near either margin, for the passage of sutures. The plate, if single, should cover the opening and the sound skin on either side, to the extent of two-fifths or the half of an inch, and through the openings should be passed sutures of silver wire. Since the foregoing was written I employed this method for an ante-scrotal fistula, with the result of almost closing the opening at the first operation. With some time and trouble I succeeded in closing the little aperture left, by means of a small wire heated by the galvanic current.

It will be readily understood that the great obstacle to success in all operations for ante-scrotal fistulæ of large size, is the passing of urine between the newly approximated surfaces. It has been previously shown that the inlying catheter does not prevent this, since urine oozes by its side. Hence its removal by other means has long been a desideratum. Accordingly, M. Ségalas adopted the method of diverting altogether the course of the urine by a perineal opening during the process of healing in the anterior wound. He did this successfully in 1839, for a patient the subject of scrotal and perineal fistulæ, dilating the latter by the bistoury, at the same time that he operated on the former; a catheter being maintained afterwards in the bladder, but through the perineal fistula.[1] Next year Ricord did the same thing, making a new opening in the perineum and carrying all the urine off through it; the result was perfectly successful.[2] Jobert, on the other hand, thought the perineal opening unnecessary, and opposed it on the ground of the presumed dangerous nature of the operation. He believed that with great attention and care on the part of the surgeon and his assistants, together with much patience and determination on that of the subject of the fistula, the plastic operation alone may be perfectly successful for ante-scrotal openings of the largest size. There is, however, no risk from the additional perineal opening worth consideration, and where the urine cannot be removed by the patient by constant catheterism, the best method when practicable, as will be seen hereafter, there is no doubt that the Ségalas and Ricord proposal is the right procedure to adopt in a case of considerable ante-scrotal fistula.[3]

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[1] *Med.-Chir. Trans.* 1845, p. 314.

In several cases, published at great length in his work, which M. Jobert treated by transplantation of a flap (this being maintained in its new position with sutures in the usual way), the exit of the urine was provided for by maintaining constantly in the passage a gum-elastic catheter, but the union was often totally wanting, and was never otherwise than incomplete at first. The flow of urine outwards through the wound could not be prevented, and the track by which it issued was always marked by non-union. Consequently, repeated operations were frequently necessary on the same individual. At best not more than two-thirds of the flap united at the first attempt; sometimes not so much as that. A troublesome fistula still remained, and fresh paring and re-paring, stitching and cauterising were necessary on several occasions before a successful result was arrived at. It is impossible to read carefully the histories of these cases, as well as those of others who have been similarly treated, without being impressed with a strong conviction that the presence of urine is the great obstacle to success; nor can the observer fail to mark how futile is the attempt to defend the wound from its deleterious action by maintaining a catheter in the canal. The urine, rising almost constantly by capillary attraction between the surfaces of the urethra and the instrument, is, by the presence of the latter, so far from being removed or carried safely away from the recently cut surfaces, rather brought into more frequent or continuous contact with them. These parts are preserved, it is true, from the effects of a gush of urine at the act of micturition, but the condition just described, scarcely less inimical to the process of adhesion, is almost inevitably a concomitant one.

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[1] *Lettre à Dieffenbach*. Paris, 1840, p. 48.

[2] The French Academy awarded the Montyhon Prize of 1841 to MM. Ségalas and Ricord, conjointly, for these operations.

[3] This is in fact the old operation of the '*boutonnière*;' one which I have so frequently employed of late with great advantage to drain and rest the bladder in cystitis following enlarged prostate and constant catheterism, as well as for 'exploring the bladder' in various conditions. See *Tumours of the Bladder*, by Sir H. Thompson, London, 1884, pp. 13–19; and *Clinical Lectures*, 7th ed. 1883, Lecture XXIV. p. 168.

But, acting on the system of teaching the patient first to pass his own catheter, I succeeded, in 1866, at University College Hospital, in completely closing a very considerable opening just in front of the scrotum. A full quarter of an inch of the floor of the urethra had been destroyed, and a corresponding portion of the catheter was seen through the opening when the instrument was passed into the bladder. Having taught the patient the use of the gum catheter, and accustomed him for a few days to withdraw all his urine by it; having explained to him the rationale of the proceeding, and made him thoroughly interested in its success, I adopted the following procedure: The margins of the opening were pared freely to the extent of the third of an inch all round. A flap nearly as large as a half-crown was then dissected from the scrotum below, about one-third of the circumference being attached, the rest free. This flap was brought up to cover the opening, and carefully secured in its place by five or six sutures of fine hard silk. The man performed his portion of the compact admirably, and in a week's time adhesion had taken place at every part of the flap, excepting at one point, just admitting a small probe. Two applications of the hot wire closed this, and he left the hospital; three months afterwards he presented himself to us at the out-patients' room, soundly healed.

It is necessary, in order to complete this part of the subject, to mention briefly here Dieffenbach's method for closing openings into the urethra immediately behind the glans, in the situation of the frænum. Such are usually the result of chancrous ulcerations. Two elliptical incisions are to be made, one transversely above, the other below the opening, and the surface so included is to be pared. (Fig. 72.) The upper and lower borders are then brought together by two points of interrupted suture, one end of each being brought out, before the knot is closely tied, at the external meatus, the other end being cut off as short as possible. The necessity for so arranging the thread arises from the next step of the operation, which consists in covering the wound and adjacent parts with a flap of skin; after which, it will be seen, that in order to withdraw the sutures at the appointed time their ends must have been previously placed in the position indicated.

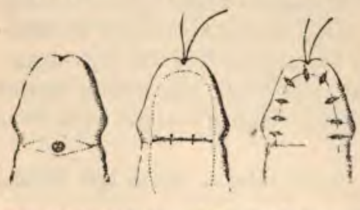

FIG. 72. FIG. 73. FIG. 74.

FIGS. 72, 73, and 74, exhibit the first, second, and third stages of the operation described in the text.

First, the skin of the adjacent surface of the glans is to be pared to the extent and in the form indicated by the semicircular dotted line above the closed wound, as seen in fig. 73; after which, the prepuce being well retracted, a corresponding portion of its inner surface, thus exposed, is pared also; indicated by the semicircular dotted line below the wound in the same figure. The prepuce is now to be drawn forwards, the two semicircular surfaces brought into apposition, and contact maintained by six or seven twisted sutures. This, the final stage of the operation, is represented in fig. 74.

**Openings in the Perineum.**—As regards the treatment of these openings, depending on loss of substance, much must depend on the necessities of each individual case. Generally speaking, such openings requiring plastic operation, are rare; the soft parts are abundant, the urethra is very deeply placed, and thus more active agents than the cautery, in some one of its various forms, are not often necessary.

Where the loss of substance has been so considerable as to render attempts by the cautery hopeless, a flap is to be transplanted from the neighbouring parts, the edge of the opening pared, and good approximation, without making any strain on the flap, insured by very fine hare-lip pins. Here also it is essential for the patient to pass his own catheter constantly.

The result of the foregoing observations on fistulous openings into the male urethra warrant, I think, the following conclusions as the legitimate deductions from the data we possess:

1. That simple urinary fistula in the scrotum or perineum, resulting from strictured urethra, does, in a large majority of cases, close and heal when the stricture has been adequately dilated.

2. That when it is necessary to treat the stricture by external division, fistulous passages should be included, if possible, in the perineal incision, when they usually heal readily and permanently.

3. That there are exceptional cases in which healing does not occur until the constitutional state of the patient is improved, and some stimulating application has been made to the sinus.

4. That a very small opening into any part of the urethra, occasioned by loss of substance, either through ulceration, sloughing, or mechanical injury, may frequently be closed by producing contraction in its parietes, by applying to them some strong chemical irritant, or the actual cautery.

5. That when there exists, anterior to the scrotum, an opening sufficiently large to admit, say, a full-sized catheter, its closure may generally be best effected by the revival of its edges, and the adaptation of a flap by displacement of the skin of the scrotum.

6. That in such case it is necessary to provide for the removal of the urine from the bladder by making the patient, before the operation,

perfectly capable of removing all his urine by catheter, and insuring his willingness to do so for some weeks after the operation has been performed. If this method is not practicable, there is no objection to that of insuring the removal of all the urine from the bladder through a small perineal opening made into the membranous urethra, in which a soft catheter should be placed for the purpose, and be allowed to remain as long as may be necessary to accomplish the object in question.

7. That when an opening occasioned by loss of substance exists in the perineum, which the actual cautery is inadequate to close, some plastic operation, adapted to the special circumstances of the case, may be resorted to, with fair prospects of success; provided that unremitting attention be paid to the withdrawal of the urine from the bladder without disturbing the wound, failing in which no good result can be anticipated.

## CHAPTER XIII.

### URINARY FEVER.

**Urinary Fever.**—This term, which corresponds to the 'Fièvre Urineuse' of the French, has been now generally adopted as the best to denote a series of phenomena which frequently appear, at a short interval after the occurrence of local lesions, often exceedingly slight, affecting certain portions, if not every part, of the urinary organs. Very seldom, the passage of a calculus down the ureter, much more frequently its transit through the urethra of the male, may occasion an attack of fever. It may follow, but very rarely, the mere passing of a bougie or catheter, although no difficulty has been experienced in the act, and no lesion is known to have been produced. It not unfrequently appears after considerable interference with the male urethra or neck of the bladder, as the result of cutting or other operations performed upon them, sometimes, even after sounding for stone; also after prolonged use of instruments in the endeavour to pass one through a confirmed and narrow stricture, especially if the attempt has been unsuccessful. In the female an attack very rarely indeed occurs, but I have met with it in two instances.[1] The most simple form of the attack consists of a single febrile paroxysm, commencing with a chill, and ending with a sweat; and this is the ordinary form which appears after the use of a catheter as above referred to. Hence it has been sometimes called 'urethral fever,' but not quite appropriately; sometimes 'catheter fever,' which is objectionable on more than one ground.

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[1] M. Chassaignac made the observation, that the 'urethral intermittent' occurs from some irritating contact with *the bulbous and anterior part* of the urethra, not with the prostatic and membranous portions; remarking that thus it never occurs in women, whatever the amount of instrumental application.—*Mon. des Hôp.* 1857, No. 135.

I think it may be said that urinary fever is met with in three different forms, or that, at all events, it may be thus conveniently referred to, in order to distinguish easily and concisely its varied phenomena for clinical purposes.

**The First is the Transient Attack of Urinary Fever.**—This form cannot be regarded as an acute fever, but merely as a simple febrile attack, acute but transient, a single paroxysm manifesting itself after some provocation, and usually occurring within two to five hours—that is, after the first passing of urine subsequently to the disturbing cause. It is one of the most common among pathological phenomena observed in connection with the urinary organs, requiring mechanical treatment of any kind, particularly when the urethra is the part affected. Supposing some slight lesion to have been occasioned by passing with some difficulty, perhaps accompanied by a little bleeding, a metallic or other instrument, in nine cases out of ten nothing happens afterwards but a little soreness on the next occasion of passing water; but in an exceptional case, within a few minutes after that act, a rigor is experienced, followed by dry heat of the skin, pains in the back, head, and limbs (not necessarily in all), with thirst and rapid pulse; after this a profuse sweat appears, with relief to all these symptoms, which soon pass off altogether, and the patient is in the course of two or three days almost as well as ever. Such is the acute transient attack. The temperature rises rapidly, and often to a high degree during the cold stage; it continues during a part of the hot stage, and gradually falls to its natural level during the sweating attack. This series of phenomena may occupy only five or six hours, or be extended over a period of twenty-four to thirty-six hours, and may be manifested with very different degrees of severity. Such an attack occurs in persons whose renal organs are quite sound. I am disposed to think that in most instances, this brief series of phenomena occurs as the result of absorption into the blood of a minute portion of urine; and that the attack described is the sign of nature's procedure to eliminate the poison, a 'storm' which clears the system. It is by far the most common form of febrile action which is met with in treating diseases of the urethra and bladder, and that to which the term urinary fever most appropriately applies. And here let it be remarked that the febrile attack thus described is of course a totally different incident from the slight 'shock,' or 'faint,' which an individual now and then experiences on the first occasion of having an instrument passed, and which is simply a momentary derangement of the nervous system. Still less is it in any way related to the fatal 'shock,' which, in excessively rare instances, has been known to succeed to simple catheterism, death occurring in twenty-four hours or so; or, further, to that less rapid but mostly fatal suppression of urine, when the renal function appears to be suddenly arrested, without adequate cause, and without notice—two conditions to be hereafter noticed. Even what may be called a 'false rigor' sometimes happens immediately or soon after an operation on the urinary passages—that is to say, a considerable series of shiverings continued for a few minutes, not followed, however, by other symptoms, and which are evidently due merely to disturbance of the nervous system, and are in no respect a manifestation of fever.

**The Second is the Acute Recurring Form of Urinary Fever.**—Let it be supposed that a patient who has had one attack of the transient form above described, and has apparently become nearly if not quite well, has another attack two or three days after, no known fresh cause of provocation having occurred. After another two or three days, not necessarily by any means a regular interval, a third attack appears, which may be followed by others; and some degree of anxiety is naturally aroused. Speaking generally, there is no ground for alarm, although the recurrence of the attack suggests the possibility of renal complication to some extent. Nevertheless, patients thus affected, although showing signs of considerably impaired health, often recover soundly with rest and care, after the local disease has been successfully treated. Such cases are occasionally met with by all who see much of stricture and cystitis, and may be denoted with tolerable accuracy by the term at the head of this paragraph.

But some of the cases which are thus classified at first sight, may turn out to be merely cases of cystitis with general fever, produced by local infection of the bladder through instruments, among which lithotrites are the most liable, from their construction and mode of employment, to convey septic poison to the organs. When thus induced, the onset of the disease is usually announced by a shiver from thirty-six to seventy-two hours after contact with the poison; one which is not necessarily repeated, and, as a rule, is not so; on the other hand, if the cystitis becomes severe, a second or a third attack of rigors may occur.

Cystitis may be caused by lithotrites, also without local infection, as a result of mechanical injury; but, in that case, the attack appears at once, and no interval like that noted above is observed between the injury and the onset of the symptoms. This form of cystitis rapidly subsides without recurrence of rigor, provided no source of irritation remains in the bladder, such as a fragment of calculus or some habitually retained urine not expelled by the patient's powers. Such cases as these are not to be regarded as examples of urinary fever.

**The Third Form is the Chronic or Continuous Urinary Fever.**— This appears generally in constitutions which have been exposed to the damaging influence of long-standing local disease in all confirmed cases of stricture; more commonly still in neglected prostatic hypertrophy, with its frequent concomitant, considerable chronic habitual distension of the bladder with urine, which the patient is unable to get rid of by any natural efforts. The febrile condition often comes on very insidiously, is not necessarily announced by a smart rigor, but commences perhaps only with a little chilliness; the patient feels languid, loses appetite, is thirsty, has a dry tongue, and appears to be feverish at all times without distinct exacerbations. The pulse is mostly a little quickened, but the temperature is not necessarily altered much, and occasionally is not affected at all. Sometimes the temperature is below the natural standard, which is by no means a promising sign. The patient may offer signs of slight disturbance in the intellectual functions, short of becoming the subject of delirium, which may be manifest as the case progresses; sensation may be more obtuse than usual, and he may be a little drowsy. Such symptoms, in exceptional instances, accompany the commencement of habitual recourse to the use of a catheter, by elderly patients, whether in the careful hands of an experienced and judicious attendant, or whether in the untutored hands of the patient himself; the appearance of such symptoms being more probable in the latter circumstances than in the former, and being sometimes encountered as the necessary price to be paid for the relief and comfort which the patient attains by learning this most useful, indeed, absolutely necessary, accomplishment to many persons. All these symptoms, however, usually subside in the course of two, three, or four weeks, and the patient slowly regains his digestive powers and bodily strength. In a few rare instances, the symptoms gradually grow worse, and the patient sinks in two or three weeks after their first appearance. In such an event, the post-mortem examination will almost invariably manifest the presence of advanced disease of the bladder, ureters, and kidneys. Although it is almost always in cases of inability to empty the bladder, caused by obstructive hypertrophy of the prostate or by atony, that the catheter has thus habitually to be used, the same necessity occasionally arises in old cases of stricture also. The bladder is liable to become partially atonied after long-standing obstruction of the urethra, and remains so not merely when that obstruction is partially relieved by dilatation, but even, although rarely, after it has been completely divided by external urethrotomy. In the latter case, the operation, while it restores complete and comfortable patency to the passage, cannot of course restore power and function to those fibres of the bladder which have become inert through want of use, or fixed by inflammatory deposit a long time before. In either case a small quantity, probably not more than two or three ounces, may habitually remain behind as a remote consequence of stricture, and require catheterism twice a day for its removal. In such instances, the urethra having become habituated to the use of instruments, no risk attends the use of the catheter; the fact is named here that it may not be overlooked, as it is rather prone to be in stricture, while the condition is mostly suspected and sought for in cases of hypertrophied prostate.

The term 'catheter fever' has sometimes been applied to denote any of the forms of fever above described, when occurring after the use of that instrument; it is better, on the whole, perhaps to dispense with it. Nor does it appear desirable to employ the term 'catheter life' for a patient who commences the daily use of that instrument, and who is generally disposed to over-estimate the gravity of the undertaking. The occurrence is not important enough to furnish an epithet to characterise the manner of his life henceforward. No doubt the habitual use of the catheter is a proceeding involving grave considerations for certain cases, but for the majority of persons who are compelled to use it, enormous as are the advantages they gain, the risk is almost absolutely *nil*, and the habit becomes, after experience, a matter of toilette rather than of surgical treatment.

Then, again, if it is desirable to make our nomenclature accord with the true pathology of the complaints described thereby, it is inconsistent to attribute the occurrence of these fevers to the employment of a catheter, since they almost invariably occur from delaying a resort to the instrument until too late a period.

How often it is true that if a bougie had been used at an early stage in the history of a stricture, or a catheter had been employed when the presence of prostatic disease was first observed, almost certainly no fever would have been met with. So that the real relation which the word 'catheter' has with the fever is, that the latter has arisen because the catheter was not used soon enough, and not as a result of its application; which has unhappily, through early error in the treatment of the case, been postponed to a stage of the complaint when it was scarcely possible to employ the instrument without provoking irritation and fever as the result.

In regard of affections sometimes loosely spoken of as examples of urinary fever, but which certainly are not so, acute inflammation of the kidney must be named. Such an affection of one or of both kidneys may speedily follow an injury inflicted on the urethra, usually by an instrument, even in cases in which there is no evidence that advanced, or indeed any, chronic renal disease had previously existed. Such an event, although rare, sometimes occurs, and I have known it to be regarded, although erroneously, as an example of severe urinary fever. I not long ago met with a published report containing long and minute details, but cannot now recall the source, evidently descriptive of a case of acute inflammation of the kidney with suppression of urine lasting for a day or two, commented on as an illustration of 'urethral' or urinary fever!

I may thus also revert to another but extremely rare occurrence, viz. the death of a patient within a few hours after the passing of a catheter, when no difficulty has existed in the operation, and no sign of lesion was observed in the urethra at a searching autopsy. Happily such an event is so peculiarly exceptional, that few surgeons have encountered it, and none have seen more than one or two instances. Only twice, during my large experience of more than thirty years, has it fallen to my lot to witness such a catastrophe. In one case, suppression of urine, rapidly followed by death, appeared to result from the introduction of an instrument larger than the patient had been accustomed to, in the hands of a surgeon who from some accidental cause had replaced the ordinary attendant, and who had unwittingly endeavoured to carry dilatation beyond the usual limit; in the other, when the ordinary instrument had been skilfully employed, and no abrasion had been made in the mucous membrane of the urethra. The rapidity with which death may occur, under these circumstances, in patients who are the subjects of extensive chronic disease of the kidneys, from an apparently exceedingly trifling lesion so caused, appears very remarkable. The fatal event seems to occur through poisoning of the system by urea; the post-mortem appearances, to the naked eye, do not resolve the problem in the cases referred to, by exhibiting traces of acute disease resulting from the particular lesion. It may be imagined that the function which determines the elimination of urea suddenly and absolutely ceases after a very slight injury to the urethra, as by the propagation of some shock to the excreting organ, in cases where its structure is seriously injured by chronic disease. I once saw a case of old-standing and narrow stricture, in which death was thus caused within fifty-four hours of the passing of an instrument, the same that had been habitually employed on at least a hundred occasions before; no damage whatever having been inflicted by it upon the urethra, as verified by a carefully made autopsy. Rigors and vomiting commenced about an hour after the catheterism, and no more urine was secreted from that time until death. In this case the kidneys were found to be greatly congested, and their substance was very soft and friable. Rapid change had evidently taken place in these organs, but no signs whatever of inflammation were traceable in any other part of the urinary apparatus.

There is another class of diseases which is not to be confounded with the urinary fevers, although it is of course impossible to determine the exact nature of an attack, when observing the rigor which announces it. I refer to acute blood-poisonings from all sources. Thus the rigors which herald the onset of a pyæmia must be encountered in a certain proportion of cases of surgical operation on the urinary passages, although with inconsiderable frequency. Septicæmic poisoning is extremely rare after lateral lithotomy, and still more so after internal urethrotomy, although no antiseptic treatment is practicable in either operation. It is more common after undue distension of the urethra; and does occasionally appear when unnecessarily large instruments are employed, either in the treatment of stricture or for the performance of lithotrity.

**Treatment of Transient or Recurring Febrile Symptoms following Urethro-Vesical Lesions.**—A patient on being attacked with rigors after any mechanical interference with the urinary passages, should be put into a warm bed, or at all events be kept warm there by ample coverings, hot bottles, &c. He may drink freely of any hot bland fluid, as of weak tea, cocoa, barley water, &c., avoiding alcoholic stimulants, such as brandy and water or the like, often given, but which are undesirable. When the cold stage ceases, and heat of skin and flushed surface appear, the bed-coverings are gradually diminished; and he may continue to take warm drinks as before, to encourage the sweating stage which naturally follows the dry heat, more or less quickly. There is no occasion to give sudorific medicines, although they often obtain the credit of producing the free perspiration which in its proper course arrives and relieves the patient. Sometimes restlessness and pain in the limbs when severe may be relieved by opiates. It has been the custom to give quinine to prevent the recurrence of the attack; and some believe that small doses of tincture of aconite control the fever. The former I believe to be of no service; the latter may sometimes perhaps have controlled or prevented symptoms. But the liability to deception is very great when administering medicines to a patient with the view of treating a series of phenomena which, if not interfered with, and especially if the subject is placed in favourable external conditions, rapidly and spontaneously proceed in nineteen cases out of twenty from the first symptoms of distress and alarm to those of returning health and comfort. For myself, no other treatment than that prescribed above is admissible if the best possible treatment is desired for the patient. If stimulants are to be given in the cold stage, together with reputed specifics (quinine and aconite), to be followed by diuretics and diaphoretics in the dry hot period afterwards, the treatment will doubtless accord with the prejudices of friends and bystanders and satisfy their natural desire to do something; but the patient will suffer from such interference, if my observation of these cases be correct. If recurrence of the attack does take place in a day or two, it is probably due to a continuing source of irritation in the passages, for which some treatment may be necessary; or it may be associated with a condition of the liver and bowels which a mild dose of blue pill and colocynth, followed by a saline aperient, is very likely to re'ieve. After that quinine may be tried. The use of the warm bath once or twice daily is often indicated. At the same time, rest and confinement to the house, unless the weather is warm and fine, must be enjoined. In the third or continuous form, mostly occurring in elderly patients, absolute confinement to the bedroom, in a uniformly warm temperature, to encourage action of the skin, is essential. Together with this, the use of opiates and soporifics may be necessary, with careful attention to the diet and action of the bowels; while now and then the moderate use of some alcoholic stimulant may be beneficial. But as this form of fever is associated almost entirely with the chronic retention of urine produced by an obstructing hypertrophy of the prostate, the reader is referred to a fuller consideration of it in a clinical lecture on that subject.[1]

In conclusion, it must be observed that only the suggestion of general observations is possible in relation to any of these cases; for the symptoms and condition of the individual vary so greatly that it is impossible to predicate a line of treatment, without investigation of the particular case for which it is required.

## CHAPTER XIV.

### STRICTURE OF THE FEMALE URETHRA.

ORGANIC stricture of the female urethra is occasionally met with, but it is so rare an affection that the facts respecting it are very few in number. The extreme rarity of its occurrence is not difficult to account for. The passage itself is so short, as compared with that of the male, and so protected by situation from exposure to lesions of all kinds, whether occurring as a result of mechanical violence or of inflammation, that it must naturally be almost exempt from the causes which have been already shown to be the great and primary agents in the production of organic stricture in the urethra of man. Thus it is not the primary seat of gonorrhœal inflammation in the female sex, nor is it affected during a long period by the chronic form after such inflammation has been present. Nevertheless, as stricture does sometimes occur, I shall offer a very brief sketch of the anatomical relations of the urethra, and then adduce the facts which have been ascertained respecting the affection in question.

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[1] *Clinical Lectures on Diseases of the Urinary Organs.* By the Author. London, 1883, Churchill, 7th ed. pp. 54-58.

**Anatomy.**—The female urethra is a mucous canal about one inch and a half in length, lying embedded within the tissues which form the anterior walls of the vagina, and constituting a channel for the passage of the urine outwards from the bladder. Possessing no sexual function like that of the interpelvic portion of the male urethra, it is not exactly analogous to it, wanting the peculiar formation of the prostatic part, and the ducts which open there in man. Its course describes a gentle curve, of which the concavity looks upwards and forwards as it passes from the neck of the bladder through the two layers of the deep perineal fascia, and opens beneath the pubic arch within the vulva, between the nymphæ, about an inch behind the clitoris. Its diameter varies from two to three lines at the external meatus, which is the narrowest part, to four or five lines at the neck of the bladder, towards which point it is funnel-shaped.

The mucous membrane is disposed in longitudinal plicæ, all of which, except one on the floor, are obliterated by dilatation, the latter bearing some resemblance to the verumontanum. The canal is capable of great distension, its character in this respect being somewhat different from that of the male urethra. Tubular mucous glands in considerable number are found at the vesical end, situated chiefly in rows between the plicæ described, while at either extremity of the canal are many small crypts into which numerous follicles enter, and these occupy chiefly its floor. Just within the external meatus there is a small depression or sinus, situated likewise in the inferior aspect.

The epithelial layer of the mucous membrane is, for the most part, composed of the stratiform variety, becoming spheroidal as it approaches the bladder. Beneath the membrane, that is, external to it, a layer of elastic fibres and of unstriped muscular fibres, intermixed, is found, continuous with the longitudinal fibres of the bladder. In connection with this is a plexiform disposition of small vessels, chiefly venous, bearing a strong resemblance to erectile tissue. Surrounding the short division of the canal, which is posterior to the deep layer of perineal fascia, is a mass of the cellular and elastic tissues, in which are embedded the crypts and follicles already described as existing in abundance there. An analogy to the prostate of man has been traced by some in this body. Between the two layers of fascia there is a disposition of voluntary muscular fibres, precisely similar to that seen in the male, and described as the compressor urethræ muscles.

**Situation of Stricture.**—The most common situation for stricture in the female urethra is the external orifice, or that part of the canal which is adjacent to it. Very rarely the constriction pervades the whole canal, or is confined to the posterior part of it.

Mr. Earle details an interesting case of stricture situated at two lines from the orifice, which occasioned so much distress in the performance of the urinary function, and so much pain about the part, that the presence of a calculus in the bladder was suspected. Division of this with a cutting instrument, followed by the use of bougies, afforded complete relief. He describes the obstruction as consisting of 'a membranous fence of about a line and a half in thickness, beyond which the passage was quite free.' The symptoms, which the patient had suffered from for years, were as follows: 'continued and urgent desire to pass urine, which at times passed involuntarily, and had for some months been loaded with a thick muco-purulent secretion, a constant sense of bearing down, burning heat of the urethra, and great pain after making water, with a constant urgency to make more immediately after she had emptied the bladder.' . . . 'The sufferings gradually increased until a constant stillicidium took place.'[1]

Sir B. Brodie states that he has seen 'a few cases,' and that he believes that 'it is always the anterior part of the canal which is affected.'[2] Speaking of one of these, he says that the external orifice of the urethra was so contracted, that during life it would only admit a small probe. The patient dying of another complaint, a preparation of the parts was obtained, and the stricture appeared to be situated 'quite at the extremity of the urethra, occupying about half an inch of the canal.'[3]

Mr. Curling has on one occasion been compelled to 'puncture the bladder in the direction of the canal beneath the pubes,' being unable to relieve existing retention by the catheter. The stricture originated in a 'contusion to which the urethra had been subjected in a protracted labour which had taken place twenty-eight years before.' In this case the obstruction was situated an inch and a half from the external orifice.[4]

Dr. Blundell relates two cases, in which he observed contraction of the entire canal 'from end to end;' in one of them there was a fistulous opening from the bladder into the vagina, by which all the urine passed. In the other no such opening existed, and the symptoms of obstruction were present; a probe only could be passed through the canal.[5]

There is a preparation of one case accompanied with retention and rupture of the bladder, in Edinburgh, in the College of Surgeons' Museum there. (See preparation No. 2020, xxxi. G. Appendix, page 236.)

During my residence as house surgeon at University College Hospital, I met with a case in which retention was due to organic contraction of the meatus. The woman had suffered in a similar manner several times, during a period of some years, and had been relieved by the introduction of small catheters, and she habitually passed a small stream with difficulty. Of late her symptoms had become worse, and she stated that on the previous occasion of retention the instrument could not be introduced without exposure. Finding this to be again necessary, after repeated attempts in the ordinary manner, it appeared on examination impossible to discover the meatus by the eye. In the situation of the opening was a little bunch of pale, firm, corrugated, insensible excrescences, about the size of mustard seeds, or a little larger, among which, first a probe and then a No. 1 gum catheter were with much difficulty carried into the canal, where the latter was tightly held. After relief had been afforded, the woman was lost sight of, and not seen again. No obvious cause for the stricture had appeared on inquiry into her history.

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[1] *Medical Gazette*, vol. iii. pp. 470–1.

[2] Lecture in *Medical Times*, vol. x. p. 460.

[3] *Brodie on the Urinary Organs*, p. 91.

[4] *Cyclop. Anat. and Phys.*, art. 'Female Urethra,' p. 1267.

[5] Lectures, *Lancet*, vol. xv. p. 643.

In the spring of 1856 I had under my care, at the Marylebone Infirmary, a woman, aged forty-three years, with organic stricture, affecting the anterior half of the urethra, and producing distressing symptoms. It appeared to have been occasioned by instrumental labour some years before. After relieving her, but only temporarily, by means of dilatation, carried from Nos. 1 to 5, I treated her by internal division, tying in a No. 12 afterwards. During next two months, No. 10 was passed at intervals and with ease. She was greatly improved by the treatment, but by no means cured, for at times she experienced temporary relapses without any apparent cause, in the urinary organs, adequate to produce them.

Respecting the nature of these contractions, it seems probable that most, if not all, may be attributed to three causes, viz.: First, to those lacerations and other injuries of the canal to which, through parturition, women are occasionally liable; and this is probably the most frequent cause. Secondly, to an extension of inflammation (the gonorrhœal in particular) from the vagina to the urethra, more particularly to the crypts and follicles which have been seen to be particularly numerous and aggregated around the external meatus. Thirdly, ulceration of any kind at the external meatus, but chiefly chancrous, may also be regarded as an occasional cause; the external part of the canal being the part chiefly obnoxious to its action. A case in which narrow stricture producing retention and overflow arose from this cause is reported in the 'Gazette des Hôpitaux' of April 6, 1846. The patient, twenty-nine years of age, applied for relief, and was treated by dilatation. She had had chancres ten years before, destroying nearly the anterior two-thirds of the canal, and by the cicatrisation of which contraction was produced. From the foregoing statements, it is not difficult to understand how it is that the anterior portion of the female urethra should be the most favourite situation for the occurrence of stricture.

**Urethral Growths.**—Independently of contractions, properly so called, the presence of excrescences at the external meatus is not an unfrequent cause of narrowing of the canal, and of extreme difficulty and pain in making water. These growths have been recognised since the time of Morgagni, who first described them as a common affection of the female urethra. The form usually met with is a florid vascular tumour, something like a small raspberry in appearance, but varying from the size of a split pea to that of a small nut. It is formed of a very soft and delicate texture, is easily made to bleed, and is often so tender as to be a source of constant suffering. It generally springs from the lining membrane of the urethra, just behind the meatus, and in its earliest stage appears only in the form of a single small florid point, or there may be several such points adjacent to each other.

The resemblance which these growths possess to the florid vascular tumour affecting the urethra of the male, and before described, is obvious.

Similar treatment also may be successfully followed in both instances. If the former admits it, as is generally the case, the excrescence should be snipped off close to its base, with a pair of scissors, and when the bleeding has ceased, a free application of caustic to the part should be made. This may be either the caustic potash or the nitric acid indifferently, in the one case defending the neighbouring parts with an acid, in the other with an alkaline solution in the usual manner. The nitrate of silver, however, is sufficient if the growth has been closely removed, and is perhaps more easy to apply.

What degree or extent of obstruction may be due at times to spasm of the compressor urethræ and other perineal muscles in the female, there is no evidence to show.

The anomalous conditions met with in the female economy in connection with the performance of the urinary function, and usually designated hysterical, are on many accounts obscure in their nature and origin. That such involuntary contractions do occur, as in the other sex, some writers state that they have reason to believe. The connection also which the state of the urinary secretion itself bears to painful and difficult micturition is to be borne in mind in relation to the subject of treatment.

As regards the management of the organic contractions, the use of dilatation, assisted, when necessary, by a division of the opposing part, as in the cases named, will generally be sufficient for their removal.

# APPENDIX.

## ILLUSTRATIONS OF ORGANIC STRICTURE AND ITS CONSEQUENCES, REFERRED TO IN CHAPTER II. ON 'THE CLASSIFICATION AND PATHOLOGY OF ORGANIC STRICTURE.'

THE following preparations, contained in the MUSEUM OF THE ROYAL COLLEGE OF SURGEONS, LONDON, are here noted as among the best illustrations of organic stricture of the urethra, as well as of those varied pathological conditions of adjacent and related organs, which result from the obstruction which stricture produces:

Nos. 2528, 2529, 2531, 2534, 2535, 2536, 2537, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2566, 2567; also Nos. 1868, 1927, and 1983.

Nos. 2568 to 2574, inclusive, are examples of the formation of false passages by the misuse of instruments. Some of these are also excellent illustrations of the hypertrophied condition of the bladder, which results from long-continued stricture.

No. 2576.—Ulceration, with 'long, irregular, and flattened bands of lymph in the urethra.' A membrane of some kind exists, formed upon the free surface of the urethral mucous membrane. (See page 33.)

No. 2577.—'A caruncle.' One of the two cases which Hunter saw and described under this name. (See page 42.)

The following are to be observed in GUY'S HOSPITAL MUSEUM:

Nos. $2087^{50}$, $2087^{75}$, 2089, 2090, $2091^{40}$, 2398, 2399, $2402^{10}$, 2405, $2407^{50}$, $2407^{75}$, 2409, 2410, $2412^{9}$, $2412^{20}$, $2412^{45}$, $2412^{50}$, $2412^{63}$, obliteration, $2412^{90}$, 2411, a 'caruncle' or small polypoid growth from the mucous membrane of the urethra. (See fig. 8, page 43.)

The following are worthy of notice in ST. BARTHOLOMEW'S HOSPITAL MUSEUM:

Series xxvii. No. 28.—The bladder and urethra of a man; the former was punctured above the pubes twelve years before death; the opening remained patent during all that time, and formed the channel by which the urine passed. The 'urethra is contracted throughout its whole length; a tough, fibrous band, an inch in length, and attached only by its extremities, extends from the verumontanum forwards to the membranous part of the urethra.' No. 33.

Series xxx. Nos. 11, 12, 13, 16, 34.

No. 37.—'A penis, in which the canal of the urethra is traversed by eleven distinct cords or bands. These bands are flat and narrow, from the eighth of an inch to half an inch in length, and attached at both their extremities to the wall of the urethra.

The following are to be noted in ST. GEORGE'S HOSPITAL MUSEUM:
Nos. S 2, 3, 21, 50, 51, 52, 70, and 78.

The following are to be noted in ST. THOMAS'S HOSPITAL MUSEUM:
Nos. BB 10, DD 3, 4, 7, 9, 10, 14, 16, 17, 23.

The following are to be noted in UNIVERSITY COLLEGE MUSEUM:
Nos. 782, 800, 815, 1063, 1228, 2185, 2425.

The following are to be noted in the EDINBURGH ROYAL COLLEGE OF SURGEONS' MUSEUM:

The fine collection of Sir Charles Bell became the property of the Royal College of Edinburgh. All the preparations noted here, excepting four (beside many others), were his, and are described in his 'Treatise on the Diseases of the Urethra,' and many of them were engraved in his 'Engravings from Specimens of Morbid Parts,' London, 1813. They are distinguished by the letter B. placed *after* the description.

Nos. 1975, 1978, 1992, xxxi. F.

No. 2020, xxxi. G.—'Bladder of a *woman*, æt. 39, ulcerated and ruptured. The urethra is seen to be strictured. The cellular tissue between the peritoneum and abdominal muscles was filled with urine.' The stricture is a narrow one; the bladder hypertrophied. B.

Nos. 2050, xxxii. A; 2054, xxxii. B; 2079, xxxii. C; 2093, xxxii. D; 2096, xxxii. D; 2096 a; 2108, xxxii. D; and 2109, 2110, xxxii. E; 2114, xxxii. E; 2120, xxxii. E; 2130, xxxii. E; 2132, xxxii. F; 2135, xxxii. F; and 2136, 2137, 2139, 2144, xxxii. F; 2159, xxxii. G, and 2160, xxxii. G.

## *TABLE OF CASES ANALYSED AT PAGE* 73.

Of the following 217 cases, the first 143 are taken from the unpublished records in the Case-books of University College Hospital.

The remainder are Cases which have been carefully watched by the author himself and by other trustworthy observers.

### *Unpublished Cases from the Case-books of University College Hospital.*

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 1. C. H. | 42 | Gonorrhœa at 17 years of age, lasting some months. | Stream of urine first observed to diminish in size 15 years after. Retention usually occurs after exposure to wet and drinking to excess. | Stricture rather narrow. |
| 2. J. D. | 25 | Gon. four years ago. Very chronic. | Stream of urine first observed to diminish in size three years after. Retention occurs when he catches cold. | Stricture rather narrow. |
| 3. J. H. | 45 | Gon. once, a few years ago. | Stream first observed to diminish one year after. Retention first occurred two years after. | A very narrow stricture. Urine passes only by drops. |
| 4. R. N. | 31 | Gon. at 16 and at 24 years. | Stream first observed to diminish after last attack. First retention four years after. Occurs when exposed to sudden changes of temperature. | Stricture rather narrow. |
| 5. J. W. | 67 | Gon. several times, syphilis also. None since 34 years of age. | Stream of urine has been small for 'many years.' Never had retention. | Stricture rather narrow. Renal disease of some standing. |
| 6. J. M. | 49 | Gon. 13 years ago, apparently soon cured. | Six months after, felt soreness and pain in the perineum when making water. Soon after, the stream became notably smaller. | Stricture rather narrow. |
| 7. C. H. | 25 | Gon. several times. | Symptoms of stricture commenced three years ago. | Stricture. |
| 8. L. B. | 66 | Gon. several times; syphilis also. | Felt pain and difficulty in making water 25 years after last attack. Retention four years after this. | A narrow stricture. |
| 9. D. M'G. | 69 | Never gon. Is subject to attacks of spasmodic asthma. | Stream of urine has been observed to diminish in size during nine years past. Retention occurs frequently. | Very slight degree of contraction habitually. |
| 10. J. P. | 32 | Never gon. Injury to the urethra by a blow on the perineum. | | An unyielding stricture. Abscess and perineal fistula. |
| 11. W. P. | 28 | Severe gon. at 20 years; habits very intemperate.<br>Discharge chronic and neglected. | Stream diminished in size, and micturition became painful, within 15 months of the attack. Retention has occurred two or three times within last two years. | A narrow stricture. |
| 12. J. D. | 45 | Severe gonorrhœa and chordee at 28 years; again at 30; habits intemperate; much exposed to wet and cold.<br>Discharge chronic. | Difficulty in passing water first observed eight years after last attack. Retention first occurred one year afterwards. | Narrow stricture. |
| 13. J. K. | 47 | Violent blow on the perineum by a fall from the rigging on board ship, when 41 years of age. | Two years afterwards retention occurred after drinking a quantity of beer. An instrument was passed with much force, and much hæmorrhage followed. Retention frequent since. | A very obstinate stricture. |
| 14. T. A. | 28 | A violent blow on the perineum at 21 years of age. | Stream of urine gradually diminished during four or five years following the accident. Then retention first occurred. | A very narrow stricture, through which an instrument is never passed. Pressure by its point against the stricture affords relief during retention. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 15. T. S. | 30 | Gon. at 23 years old<br>Discharge continued for a long time after. | Stream first observed to diminish about one year after; retention was the first symptom occurring, before a year had expired, after cold and excess of drink. | A narrow stricture. |
| 16. J. D. | 16 | Gon. a month ago. | | Inflammatory stricture causing retention. |
| 17. J. D. | 36 | A fall injuring the perineum. | Symptoms of stricture appeared almost immediately after the accident. | A narrow and obstinate stricture, three months and a half after. |
| 18. J. W. | 36 | Gon. at 34 years; intemperate.<br>Discharge has never ceased. | Stream first observed to diminish one year and a half ago; retention has occurred frequently during the last year, after drinking or exposure to cold. | Stricture. |
| 19. D. G. | 26 | Gon. at 20 years.<br>Soon cured. | Symptoms of stricture appeared in less than two months after. | A narrow stricture with perineal abscess and urethrorectal fistula. |
| 20. G. B. | 27 | Gon. six or seven times; last attack nine months ago. | Stream of urine is usually of tolerable size, but varies much and frequently; retention has occurred three times during the last three months. | Stricture. |
| 21. C. M. | 43 | Gon. many times; syphilis; intemperate; has resided in the East Indies.<br>Never free from some urethral discharge. | Stream first observed to diminish 18 years ago; abscesses in the perineum have formed several times during the last 15 years. | Urethra strictured at two or three points; two fistulæ. |
| 22. J. W. | 50 | Gon. 20 years ago. | Stream first observed to diminish about two or three years ago; pain in passing water for some time. | Three or four strictures. No.1 catheter passed with difficulty. |
| 23. J. R. | 68 | Gon. several times; last attack very severe, 2 years ago. | Stream first observed to diminish about nine years ago. | A narrow stricture, and retention with overflow. |
| 24. T. S. | 30 | Gon. several times.<br>Chronic. | Symptoms of stricture appeared about nine years ago. | Stricture and gon. |
| 25. G. F. S. | 54 | Injury from the pommel of a saddle while riding, 32 years ago. | | A narrow stricture and perineal fistulæ. |
| 26. D. H. | 41 | Gon. 17 years ago.<br>Very chronic. | Retention seven years after, which was the first symptom of stricture; it frequently recurs. | A narrow stricture. |
| 27. F. J. M. | 17 | A blow on the perineum at eight years of age. | Stream of urine has been observed to diminish ever since. | A narrow stricture; fistulæ; retention. |
| 28. H. G. | 23 | Gon. and severe chordee a year and a half ago.<br>Discharge chronic. | Stream observed to become smaller in about four or five weeks after. | A narrow stricture; passes his urine by drops; retention with overflow of ten months' standing. |
| 29. G. S. | 43 | Gon. several times between the 18th and 22nd year.<br>Seldom free from discharge. | Difficulty in passing water was observed soon after last attack; retention several times within last 15 years. | Stricture, but not very narrow. |
| 30. H. S. | 23 | Gon. at 19; again at 22 years.<br>Last attack very obstinate. | Difficulty in passing water for six months past; size of stream varies. | A very narrow stricture. |
| 31. G. K. | 32 | Gon. ten years ago.<br>Rather chronic. | Stream observed to pass less freely than usual within two months after. | A narrow stricture; retention. |
| 32. J. P. | 25 | Gon. about 6 months ago with severe chordee.<br>Discharge has continued until now. | Stream observed to become smaller about three months ago. | Retention occurring immediately after complete and sudden cessation of the discharge. |
| 33. D. B. | 33 | Gon. 12 years ago, for which he received much treatment. | Stream observed to become smaller eight years ago. | An exceedingly narrow and obstinate stricture. |
| 34. J. F. | 36 | Gon. twice about seven or eight years ago. | Stream observed to become a little smaller soon after. | Stricture; abscesses in the perineum. |
| J. B. | 63 | Gon. much neglected about 24 years ago.<br>Very chronic. | Symptoms of stricture appeared about four years after; occasional retention on exposure to cold. | Stricture and abscesses in the perineum. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 36. H. H. | 50 | A severe blow on the perineum while riding a restive horse, followed by hæmorrhage from the urethra seven years ago. | Stricture immediately followed, improved by dilatation; no treatment for last two years; has gradually become worse since. | A very narrow and obstinate stricture; perineal abscesses. |
| 37. J. L. | 41 | Gon. 20 years ago. | Symptoms of stricture first noticed about three years after; retention several times since; first attack 14 years ago. | A narrow stricture: extravasation of urine; abscesses in perineum. |
| 38. C. P. | 23 | Blow on perineum two months ago, followed by retention of urine. | | A narrow stricture already. |
| 39. E. S. | 40 | Gon. 17 years ago, and syphilis. | Symptoms of stricture first observed three or four years after. | Stricture and retention for the first time, after drinking to excess. |
| 40. J. B. | 35 | Gon. three or four times within last 10 years.<br>Very chronic, and never received any treatment. | Stream passed with difficulty six years ago; first attack of retention two years ago; has frequently recurred since. | Stricture. |
| 41. J. H. | 33 | Gon. 15 years ago.<br>Lasting six months. | Stream observed to become smaller one year after. | Stricture and incontinence. |
| 42. L. H. | 29 | Gon. seven or eight years ago; habits very intemperate.<br>First attack very chronic. | Stream observed to become smaller about a year and a half ago; retention frequently since. | Stricture and retention. |
| 43. M. P. | 27 | Gon. five years ago; much exposed to cold and wet.<br>More or less discharge ever since. | Retention several times within last two or three years. | Stricture and retention. |
| 44. T. S. | 36 | Gon. about six months ago. | Discharge suddenly stopped; symptoms of stricture followed in a day or two, and have persisted ever since. | Stricture not very considerable. |
| 45. J. H. | 37 | Gon. about 16 years ago.<br>Lasting 12 months. | Symptoms of stricture observed about nine months after cessation of the discharge; retention several times since. | Stricture and albuminuria. |
| 46. E. B. | 40 | Gon. three times; last attack 15 years ago.<br>Gleet long continued. | Symptoms of stricture appeared about a year after the last attack; retention many times during last 10 years. | Very obstinate stricture; fistula in perineo; has been treated in almost every hospital in London. |
| 47. W. M. | 40 | Gon. four or five times. | Symptoms of stricture first observed about four or five years ago. | Stricture. |
| 48. F. G. | 23 | Fall across a beam, followed by hæmorrhage from urethra and retention of urine, about a year and a half ago. | Symptoms of stricture soon followed. | A narrow stricture: general health much affected. |
| 49. J. B. | 26 | Gon. six years ago.<br>Lasting some months. | Stream observed to become small some years back; micturition difficult for twelve months past. | A narrow stricture; urine passes by drops. |
| 50. W. S. | 40 | Gon. and chancres nine years ago. | Occasional obstruction to micturition seven years ago. | Narrow stricture and perineal abscesses. |
| 51. W. F. | 42 | Gon. 24 years ago; again about a year after.<br>Last attack chronic. | Thinks he has never passed water so freely since last attack; retention 17 years ago; recurring when he catches cold. | Stricture and retention. |
| 52. R. L. | 34 | Gon. five times; last attack two years ago. | Retention a month after last attack of gonorrhœa; has recurred frequently since; usually after excess in drinking. | Stricture and retention. |
| 53. W. R. | 48 | Gon. three times; last attack four years ago.<br>Gleet ever since. | | A very unyielding stricture with urinary fistulæ. |
| 54. J. H. | 44 | Gon. 15 years ago.<br>Discharge very chronic. | Symptoms of stricture observed about six months afterwards; retention ten years ago, following violent exercise. | A narrow stricture. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 55. D. B. | 37 | Gon. 'many years ago.' | About ten years after, went to West Indies, where he found difficulty in making water, for the first time, which has increased since; perineal abscesses seven years ago. | Narrow stricture; extravasation of urine; abscesses in perineum and above pubes. |
| 56. J. W. | 42 | Severe blow on the perineum; hæmorrhage from the urethra after.<br>Apparently soon recovered. | Stream began to grow smaller not long after; retention three years after, following excess in drink. | Stricture and retention. |
| 57. J. W. | 63 | Gon. and chancres 37 years ago; extremely careless in his habits.<br>Always some discharge. | Was treated for stricture more than 23 years ago; abscesses in perineum soon after. | Stricture, fistulæ, and renal disease. |
| 58. R. T. | 43 | Gon. 12 years ago, neglected.<br>Discharge continued two or three years. | Symptoms of stricture first observed during that period. | Stricture, syphilis cachexia, albuminuria. |
| 59. H. S. | 81 | Severe gon. and chancres at 20 years; habits very intemperate. | Stream observed to become smaller a year or two ago, and retention has occurred two or three times within the same period. | Stricture and retention; albuminuria. |
| 60. J. M. | 42 | Gon. several times since 20 years old; intemperate.<br>Some discharge from the urethra almost always present. | Symptoms of stricture have existed for ten years past; retention several times. | Narrow stricture; retention and perineal abscesses. |
| 61. R. M. | 40 | Severe gon. and phymosis at 21; residence for some years since in the West Indies. | No symptom of stricture until 17 years after, when sudden retention came on after drinking beer and taking much exercise. | A narrow stricture; general health much impaired. |
| 62. J. P. | 47 | Gon. 10 years ago; second attack seven years ago.<br>Urethral discharge ever since last attack, increased by exposure to cold. | Difficulty in passing water during last six years. | A very narrow stricture; urine passes by drops and involuntarily. |
| 63. W. B. | 49 | Gon. 15 years ago.<br>Discharge continued for year and half afterwards. | Difficulty in passing water of 14 years' duration; occasional attacks of retention. | Stricture and retention. |
| 64. H. D. | 38 | Gon. three or four times; last attack twelve years ago.<br>Ever since last attack has suffered some pain in the urethra, and from trifling hæmorrhage. | Symptoms of stricture during five or six years; retention several times. | Two strictures, perineal and recto-vesical fistulæ. |
| 65. C. —. | 49 | Gon. when young.<br>Discharge almost constant, increased by excess in drink. | Stream first observed to become smaller about six years ago, when retention followed a debauch. | Stricture. |
| 66. J. Q. | 33 | Gon. at 20 years.<br>Discharge soon ceased. | Stream first observed to become smaller within a month; retention, after drinking, in a year's time. | Very narrow stricture, perineal fistulæ, scrotal ditto, through which all the urine passes. |
| 67. H. P. | 24 | Gon. four or five years ago.<br>Discharge lasting 12 months. | Abscess and inflammation 9 months after; fistula, through which the urine passed; after it had healed, symptoms of stricture began to appear. | Stricture not very narrow. |
| 68. A. R. | 32 | Gon. several times; last attack three weeks since.<br>Discharge soon ceased. | | Retention, after drinking, from inflammatory stricture. |
| 69. C. S. | 58 | Severe gon. with phymosis, at 17 years.<br>Discharge chronic. | Stream has been smaller than natural ever since; gradually worse of late. | Stricture and retention. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 70. J. D. | 58 | Last attack of gon. six years ago.<br>Soon cured. | Symptoms of stricture first observed one year ago. | Stricture. |
| 71. J. R. | 38 | Severe gon. 16 years ago; neglected.<br>Discharge continued many months. | Stream observed to become smaller soon after. | Narrow stricture and retention. |
| 72. J. T. | 48 | Gon. two or three times; last attack 16 years ago. | Stream observed to become smaller after last attack. | Narrow and obstinate stricture. |
| 73. J. W. | 56 | Gon. at 16, never since; takes much horse exercise, but has not received any injury in the perineum that he is aware of. | Difficulty in passing water first observed about 12 months ago. | Narrow stricture; urine passes only by drops. |
| 74. J. W. | 55 | Last attack of gon. 16 years ago; attributed to the use of strong injections. | Difficulty in making water appeared within a month after the attack. | Stricture which has been repeatedly dilated; renal disease. |
| 75. R. C. | 22 | Severe gon. two years ago. | More or less difficulty in passing water since, especially after drinking or exposure to cold. | Stricture not very narrow; retention for the first time. |
| 76. W. K. | 84 | Repeated attacks of cystitis from the age of 14, without appreciable cause; gon. at 20 years. | Symptoms of stricture first observed about the age of 34; perineal section four years ago; fistula since through which the urine passes. | A very narrow stricture; perineal fistula and abscesses. |
| 77. J. B. | 39 | Gon. and chancres 13 years ago.<br>Discharge chronic. | Stream observed to become smaller soon after. | Very narrow stricture; retention. |
| 78. J. C. | 13 | A blow on the perineum two years ago followed by hæmorrhage. | Partial incontinence a week after, continuing more or less ever since. | Stricture, nephritis, and death. |
| 79. T. H. | 66 | Gon. at 20 years and at 26.<br>Discharge chronic. | Stream began to diminish as the discharge decreased; treatment at intervals in several hospitals since. | Narrow and unyielding stricture; false passages; urine passes by drops. |
| 80. J. M. | 56 | Gon. at 21, and chancres; again at 34; severe chordee. | Stream began to grow smaller soon after the last attack; retention not long after; much treatment at different times. | Narrow stricture and perineal fistulæ. |
| 81. J. D. | 15 | Blow on the perineum three months ago, followed by retention of urine. | Stream has become smaller ever since. | A very narrow stricture; urine passes by drops. |
| 82. J. C. | 30 | Three attacks of gon. within six years.<br>More or less discharge ever since. | Stream has become smaller since the second attack; retention first occurred three years and a half ago. | Narrow stricture. |
| 83. H. W. | 28 | Gon. with chordee, nine years ago.<br>Lasting 12 months. | Retention eight years ago, frequently recurring since; after this a blow on the perineum and hæmorrhage. | A narrow stricture. |
| 84. J. G. | 54 | Gon. several times; last attack seven years ago.<br>Neglected and very chronic. | Stream observed to become smaller as the discharge from last attack ceased; retention three years ago; perineal abscess one year ago. | Two or three strictures; fistulæ in perineum; albuminuria. |
| 85. J. A. | 27 | Gon. six or seven years ago. | Stream observed to become smaller as the discharge ceased. | Stricture not narrow, but liable to become so from drinking or exposure to cold. |
| 86. E. B. | — | Gon. five times. | Stream observed to become smaller after the second attack, 12 years ago; became worse after each subsequent attack. | Narrow stricture; urine passes by drops; perineal abscess. |
| 87. S. B. | 46 | Gon. at 21. | Stream observed to become smaller a year after; gradually diminished during ten years. | Narrow stricture; albuminuria, with general health very much affected. |
| 88. J. A. | 38 | Gon. several times between 20 and 30 years. | Stream observed to become smaller nine or ten years ago. | Narrow stricture; disease of the renal organs. |
| 89. J. W. | 47 | Gon. eight years ago.<br>Lasting some months. | Stream observed to become smaller soon after; incontinence at night for some time past. | A narrow and obstinate stricture; water passes by drops. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 90. P. H. | 62 | Gon. and chancres 30 years ago.<br>Discharge continuing for many months. | Symptoms of stricture first observed 20 years ago; first attack of retention four years ago; several since. | A narrow stricture; retention; perineal abscesses. |
| 91. R. O. | 28 | Gon. and chancres about a year ago; much horse-exercise shortly after. | Symptoms of stricture soon followed, with abscess and fistula. | A narrow stricture, fistula in perineo; gon. |
| 92. J. S. | 39 | Gon. five years ago. Gleet lasting nearly twelve months. | Unusually frequent micturition in two months after: then narrowing of the stream; irritability of bladder occurs after drinking or exposure to cold. | Stricture not very narrow; incontinence. |
| 93. J. L. | 23 | Gon. year and half ago;<br>Again about a month ago. | Complete retention a fortnight ago; recurred a few days after. | Retention for the third time, relieved by No. 8 catheter; urethral discharge; no organic stricture appreciable during after-treatment. |
| 94. J. F. | 51 | Severe gon. at 21 years; chordee, orchitis, &c.<br>Gleet for some time after. | | Stricture of long standing, not very narrow; urine albuminous. |
| 95. J. P. | 52 | Severe gon. 18 years ago.<br>Discharge never entirely ceased. | Stream has gradually become smaller ever since. | A narrow stricture; retention; abscess in perineum. |
| 96. C. M. | 28 | Gon. many times; habits very intemperate.<br>Rarely without some discharge from the urethra. | Retention first occurred between six and seven years ago; repeated attacks and narrowing of the stream since. | Very narrow and obstinate stricture. |
| 97. B. S. | 30 | Gon. four years ago. | Symptoms of stricture first observed three years ago. | A narrow stricture; retention following prolonged debauch and exposure to cold. |
| 98. C. W. | 27 | Gon. two or three years ago; again five months ago, and chancres. | States that he has been unable to 'retain his urine above an hour or two since the first attack.' | Stricture and irritable bladder. |
| 99. T. C. | 44 | Gon. and chancres 25 years ago; habits intemperate; much exposed to cold. | Did not observe the stream of urine to be smaller than natural until six months ago; abscess in perineum. | Narrow stricture and incontinence. |
| 100. W. W. | 46 | Gon. at 18 years, lasting nine months. More or less discharge has continued ever since. | Difficulty in passing water first observed about eight years ago; since that time instruments have been rudely applied. | Narrow stricture; hæmorrhoids; irritable bladder. |
| 101. G. B. | 52 | Unusually severe gon. when young, orchitis, &c.; residence in India. | 13 years ago retention occurred, relieved by catheter; the stream of urine continued of the natural size until lately, when it began to narrow rapidly. | Narrow stricture; abscess and fistula in perineo. |
| 102. J. S. | 62 | Never had gon.; much exposed to wet and cold; subject to attacks of dyspnœa. | 10 years ago an attack of retention, without any cause that the patient can assign; retention frequent of late. | Stricture not very narrow; retention. |
| 103. J. D. | 30 | Gon. repeatedly within the last 10 years; chancres; urethritis much increased by horse-exercise.<br>Discharge, in some quantity, always present. | | Two narrow strictures; irritable bladder and urethra. |
| 104. J. P. | 61 | A violent blow from the pommel of a saddle while riding soon relieved from immediate effects by treatment. | After which stream slowly diminished in size; retention has frequently occurred after drinking. | A narrow stricture; perineal abscesses; extravasation of urine; perforation of bladder and death. |
| 105. C. T. | 64 | Severe gon. when young.<br>Gleet long continued. | Stream observed to become smaller soon after; improved by dilatation; some years after, symptoms return with each attack of gout, to which he is subject. | Stricture varying much in condition at different periods. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 106. W. B. | 27 | Gon. seven years ago. Continuing for a long period. | Symptoms of stricture observed rather more than three years ago; retention has occurred since under circumstances of mental excitement, and unconnected with drinking. | A narrow stricture; retention. |
| 107. G. S. | 27 | Gon. three years ago. Soon cured. | Difficulty in passing water occurred with the cessation of the discharge; increased at all times by drinking. | A stricture not very narrow; retention. |
| 108. W. W. | 68 | Gon. frequently when young. | Stricture of 42 years' duration; stream varies much in size. | Stricture not very narrow; renal disease. |
| 109. C. B. | 65 | Gon. when young. Soon cured. | Difficult micturition followed almost immediately; retention occurred first 10 years ago, relieved by operation in the perineum; fistula. | Stricture and renal disease. |
| 110. E. C. | 31 | Gon. nine years ago. Very intemperate.<br>Gleet has continued to the present time. | Stream observed to become smaller of late. | Stricture; retention; perineal abscess; extravasation of urine. |
| 111. H. E. | 35 | Gon. 15 years ago; twice during last four years. | Stream observed to become smaller since last attack. | Stricture and retention. |
| 112. R. S. | 41 | Gon. nine years ago; urethral discharge recurs after drinking to excess; very intemperate. | Retention first occurred after drinking to excess three years ago; stream observed to become smaller since; retention several times. | Stricture not very narrow; retention. |
| 113. G. C. | 30 | Gon. some years ago; much exposed to wet and cold. | Retention has followed exposure to cold and wet; instruments have been passed with much force. | Stricture. |
| 114. J. W. | 63 | Gon. 'nearly thirty years ago.' | 'No difficulty in making water until about two years ago; much deposit in the urine at that time; stream has become smaller ever since.' | Stricture; retention; extravasation, and death. |
| 115. R. D. | 40 | Gon. many years ago. | Symptoms of stricture first observed five years ago; always aggravated by indisposition of any kind. | Stricture; retention; perineal abscess. |
| 116. T. H. | 52 | In India, 17 years ago, his horse fell upon him, and retention of urine followed.<br>Four years of good health followed recovery from this accident. | Retention first followed exposure to wet and cold in this country; symptoms of stricture now appeared; much treatment and little improvement. | Narrow and obstinate stricture; general health bad. |
| 117. W. J. | 61 | Gon. 30 years ago; intemperate; much exposed to cold and wet.<br>Gleet remained two or three years. | Stream observed to become smaller soon after; retention has occurred occasionally. | A long and narrow stricture; renal disease; large calculus in the bladder; death. |
| 118. J. B. | 28 | Gon. nine years ago. | First treated for stricture two years ago. | Narrow stricture; urinary abscesses; death. |
| 119. J. A. | 39 | Asserts that he never had gonorrhœa (?) Seven years ago suffered much scalding in micturition, for which he can assign no cause. | Difficulty in passing water followed this. | A stricture, but by no means narrow. |
| 120. J. E. | 40 | States that he never made so large a stream when a boy as others do; gon. 20 years ago. | Increased difficulty in micturition for 12 years past; experiences a return of the discharge whenever he drinks freely, or is exposed to wet and cold. | Stricture; retention. |
| 121. G. R. | 43 | Gon. six years ago. | Stream has been observed to become smaller ever since; retention first occurred two years ago. | Stricture and retention. |
| 122. J. B. | 45 | Gon. 13 years ago. | Retention has occurred whenever he drinks to excess, during the last six years. | Stricture and retention. |
| 123. T. C. | 52 | Gon. twice; last attack about 25 years ago. | Stream observed to become smaller about 15 years ago; three years ago retention and perineal section, since which the stream has again diminished. | No. 3 passes now, but with difficulty. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 124. E. F. | — | Gon. several times. | Symptoms of stricture first appeared about 20 years ago, which increase considerably when the urine is acid. | Stricture not very narrow; retention. |
| 125. H. B. | 39 | Gon. 14 years ago; urethral discharge frequently brought about on slight irritations.<br>More or less discharge from the urethra is usually present. | Symptoms of stricture first observed about three years ago. | Stricture not very narrow. |
| 126. J.W.S. | 41 | Gon. at 18.<br>Discharge has never altogether ceased. | Symptoms of stricture appeared soon after the gon.; retention has occurred two or three times since. | Stricture and retention. |
| 127. C. H. | 48 | Gon. 25 years ago. | Symptoms of stricture appeared for a short time 10 years ago, but disappeared; three years ago became worse, after straining at work. | Narrow stricture and retention. |
| 128. S. K. | 34 | Gon. five years ago. Lasting 3 months. | Symptoms first appeared one year and a half ago. | Stricture rather narrow. |
| 129. P. G. | 64 | Gon. several times; last attack at 40 years of age. | Symptoms of stricture appeared with the last attack of gonorrhœa; have gradually become worse of late. | Very narrow stricture. |
| 130. W. R. | 52 | Chancres about the glands twice; congenital epispadias. | Stream of urine diminished after last attack; abscess in the perineum recently. | Meatus exceedingly narrow from cicatrisation of the chancres; urine passes only by drops; fistula in perineum. |
| 131. C. T. | 38 | Gon. three or four times about 12 or 15 years ago. | Stream of urine observed to become smaller about ten years ago; abscess in perineum, and retention four years ago. | Narrow stricture. |
| 132. B. W. | 26 | Gon. twice; two years since last attack.<br>Gleet followed. | Difficulty in passing water observed about six months ago. after drinking and exposure to cold; stream smaller ever since. | Stricture. |
| 133. W. O. | 20 | Gon. and chancres one year and a half ago; habits exceedingly bad.<br>Discharge never ceased. | Stream of urine had become very small twelve months after. | Very narrow stricture; water dribbles away involuntarily; extensive disease of the kidneys, and death. |
| 134. R. T. | 48 | Never had gon. | Stream of urine becomes smaller in cold and damp weather. | Narrowing of the urethra, from congestion or subacute inflammation; perineal abscess. |
| 135. S. H. | — | Injury to perineum twice within two years. | Stream soon observed to become smaller after the first injury. | Intractable stricture. |
| 136. W. J. | 35 | Gon. many years ago; and again two months ago. | | Inflammatory stricture and retention. |
| 137. G. T. | 53 | Syphilitic ulceration destroying great part of the penis 20 years ago. | | Stricture at orifice, and also in posterior part of urethra; abscesses and fistulæ; the first named being impassable, perineal section was performed. |
| 138. J. C. | 33 | Gon. six weeks ago. | | Stricture and perineal abscess. |
| 139. W. C. | 24 | Gon. two or three times; last attack six months ago.<br>Discharge chronic. | Inflammation re-induced by sexual connection. | Inflammatory stricture. |
| 140. G. L. | 68 | Many years ago had gon. | Stream became very small during and after the attack, but resumed its natural size. | Temporary stricture and retention after drinking. |
| 141. G. H. | 35 | Gon. about 13 years ago.<br>From which he quite recovered. | An attack of retention six years ago; cause unknown; repeated attacks since, after excess in drink, &c. | Slight organic stricture; spasm and inflammation supervening cause retention. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 142. G. H. | 32 | Gon. about 14 years ago. | Stream of urine first observed to become smaller about seven years ago. | Stricture, retention, extravasation and death. |
| 143. W.W. | 52 | Several attacks of gon. in early life; a sailor, and much exposed to cold.<br>Attacks neglected, and of long duration. | Symptoms of stricture appeared in a few years; first retention 17 years ago; much treatment at different times; fistula in perineo, which has since healed. | Two narrow obstinate strictures; water passes by drops. |

## *Cases by the Author and other known Observers.*

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 144. A. B. | 19 | Laceration and division of the urethra by injury when a child. | Has passed all the urine by fistula in the perineum ever since. | Complete obliteration of the canal, and fistula in the perineum. |
| 145. W. D. | 49 | Gon. four or five times when young; the last attack 20 years ago.<br>Some discharge from the urethra ever since. | Retention nine years ago, succeeding prolonged efforts (voluntary) to retain his urine, since which the stream has become smaller. | Two or three strictures; one very narrow. |
| 146. E. M. | 18 | No injury or other cause that can be ascertained. | Stricture has existed ever since he was eight years old; retention occurring every three or four months; of late it has often followed drinking freely of beer. | Stricture, but not narrow; obstinate retention. |
| 147. E. J. | 23 | Gon. six months ago; very intemperate.<br>Gleet since. | Stream has been observed to grow smaller of late. | Retention following debauch; stricture not narrow. |
| 148. M. M. | 60 | Gon.; last time 20 years ago.<br>Which continued some months. | Stream has been decreasing in size since, varying at times. | A narrow and obstinate stricture; retention. |
| 149. J. T. | 49 | Gon. 25 years ago.<br>Very chronic. | Retention was the first symptom observed, occurring after transition from very hot to a very cold temperature; has recurred since. | Narrow and obstinate stricture. |
| 150. H. H. | 37 | Nine years ago was crushed against a wall by some horses; Ill for succeeding three months. | His water has passed with more or less difficulty ever since; occasional retention; incontinence of late. | Very narrow stricture; urinary organs greatly diseased; death. |
| 151. J. B. | 27 | Gon. five or six times between the age of 18 and 24, when in the East Indies.<br>Discharge very chronic. | Stream first observed to be a little smaller than usual about two years after. | A stricture, not narrow. |
| 152. C. H. | 49 | Gon. at 16; slight urethral discharge at times since; frequent but not severe; very intemperate.<br>Chronic and neglected. | Stream of urine first observed to become smaller six years ago: retention several times after drinking immoderately. | Narrow and obstinate stricture. |
| 153. R. E. | 44 | Last attack of gon. at 40 years of age.<br>Gleet after. | Symptoms of stricture observed three years ago. | Stricture not very narrow. |
| 154. G. W. | 54 | Gon. when young, and again at the age of 41.<br>The discharge never entirely ceased after last attack. | Symptoms of stricture first observed about 10 years ago. | Stricture not very narrow; perineal fistula. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 155. C.T.B. | 26 | Exposure to cold after severe exercise; recent gon. apparently almost well. | | Inflammatory stricture suddenly induced, causing retention. |
| 156. A. J. | 53 | Never gon.; acid urine; gouty diathesis. | | Considerable narrowing of the stream of urine, lasting for some time. |
| 157. C. W. | 29 | Gon. four or five times.<br>Discharge has been chronic and neglected. | Thinks the stream of urine diminished in size very soon after the last attack. | Stricture in two places; not very narrow. |
| 158. W. M. | 37 | Gon. three times—once with chancres.<br>Last attack eight years ago, followed by gleet. | About 12 months after, the stream became smaller also; is more so at times than others. | Stricture rather narrow; urethra irritable and tender. |
| 159. T. B. | 26 | Gon. several times.<br>Discharge constant. | Narrowing of the stream about three years ago; retention 12 months ago. | Stricture. |
| 160. P. O. | 48 | Never gon.; acid urine, gout, and rheumatism.<br>Urethral discharge occasionally. | After exposure to cold the stream becomes narrower. | Stricture about six inches from the orifice; irritable urethra. |
| 161. G.M'K. | 24 | Gon. once; stream smaller than natural ever since he can remember; irritable bladder. | Immediately after gon. the stream narrowed and symptoms became worse. | Narrow stricture. |
| 162. C. Y. | 36 | Gon. at 20; again two years ago; much on horseback.<br>Last attack chronic. | Symptoms worse after riding; stream has grown smaller during last two or three months. | Stricture. |
| 163. B. J. | 40 | Gon. three or four times; last attack ten years ago; drinks freely.<br>Chronic. | Stricture of seven years' standing; treatment several times; retention twice. | Narrow and irritable stricture. |
| 164. D. J. | 32 | Gon. twice six years ago; four years ago 'riding on the bare back,' was suddenly seized with pain and lost blood from the urethra. | Stream observed to become smaller some time after; has had instruments passed since, but with difficulty. | Narrow stricture. |
| 165. J. J.T | 36 | Gon. two or three times.<br>Discharge has existed for a long time. | Stream smaller, and unusual difficulty in passing water for the last two or three years. | Stricture not very narrow. |
| 166. G. F. | 29 | Gon. only once, three years ago.<br>Neglected and chronic. | Urine passes in a divided stream; much pain in hypogastrium and loins for some time past. | Narrowing of the urethra, not considerable, about an inch from the meatus. |
| 167. T. P. | 23 | Fell through the staves of a ladder when at work; some hæmorrhage from the urethra followed. | Within two months passed urine in a small stream. | Stricture not very narrow. |
| 168. T. G. | 30 | Gon. three times; last attack three years ago.<br>Has had discharge ever since. | Stream of urine became smaller very soon after last attack; the difficulty has since increased. | A narrow stricture. |
| 169. H. K. | 58 | Gon. once, when young; several times lately he has observed a little urethral discharge, without any cause that he is aware of. | Urine alkaline; general health much depressed of late; sometimes the urine passes with much straining. | Slight stricture at the bulb; urethra irritable; digestive organs much out of order. |
| 170. W. J. | 26 | Gon. three times; last attack two years since.<br>Some discharge lasting 6 months. never wholly subsiding. | For 12 months past there has been some difficulty in passing water; pains about loins at times, and in the urethra. | Stricture not narrow but extremely irritable. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 171. C. B. | 41 | Gon. several times; habits very irregular.<br>Discharge frequently occurs, and has been neglected. | Has had stricture for seven years, more or less; retention three years ago. | Stricture rather narrow; swelling in perineum. |
| 172. W. K. | 43 | Injuries to the perineum 13 years ago. | Stricture ever since; his urine has passed, for 12 years past, entirely through fistulous openings in the scrotum. | Narrow stricture; fistulæ. |
| 173. W. B. | 60 | Never had gon.; subject to hæmorrhoids for 20 years. | Difficulty in making water has existed for 12 years; first retention a year ago. | Stricture and retention. |
| 174. W. D. | — | | Never recollects to have passed water in a full stream. | A narrow stricture at the meatus externus, presumed to be congenital. |
| 175. G. B. | 28 | Gon. six years ago. | Difficulty in passing urine soon followed. | Stricture. |
| 176. ——. | 61 | Gon. 16 years ago.<br>Discharge never ceased. | Difficulty in passing water for last two years. | Stricture and retention. |
| 177. S. S. | 42 | Severe gon. 15 years ago.<br>Gleet following, lasted some years. | Difficulty in passing urine for many years. | Stricture and retention. |
| 178. — C. | 49 | Gon. 10 or 11 times.<br>Last attack was followed by a profuse and chronic discharge. | Stricture has existed for several years. | Stricture and retention. |
| 179. W. L. | 55 | Gon. many years ago. | Difficulty in micturition only commenced four years ago. | Stricture, abscess, and retention. |
| 180. ——. | 36 | Gon at 19.<br>Discharge more or less for 10 years. | Symptoms of stricture appeared at its cessation. | Stricture and retention. |
| 181. W. R. | 38 | Blow on the perineum 10 years ago, followed by hæmorrhage. | Difficult micturition soon followed; incontinence for five or six years. | Stricture and fistulæ. |
| 182. H. J. | 34 | Violent blow on the perineum 6 months ago, followed by hæmorrhage. | Difficult micturition soon followed. | Narrow stricture. |
| 183. A. B. | 50 | Gon. 20 years ago. | Narrowing of the stream a few months after; catheterism more or less ever since. | Stricture; urine passes only by drops. |
| 184. S. N. | 31 | Two years ago had chancres; one at the external meatus. | Cicatrix followed at the meatus, which gradually contracting, caused difficulty in micturition. | Stricture and perineal abscess. |
| 185. B. M. | 32 | Gon. five years ago.<br>Quickly cured. | Symptoms of stricture appeared very soon after. | Stricture and retention for the first time; death from rupture of the bladder. |
| 186. M. D. | 33 | Gon. 4 months ago.<br>Used strong injections of sulphate of copper, which gave much pain. | Difficult micturition soon after; increasing since. | Stricture. |
| 187. J. W. | 42 | Gon. twice; 4 years ago, a fall from an omnibus, followed by bloody urine. | Difficult micturition soon followed; retention frequently occurs, especially after drinking. | Stricture. |
| 188. R. P. | 46 | Gon. 14 years ago. | Stream observed to become smaller soon after. | Stricture, fistulæ, perineal section, and death; disease of the kidneys. |
| 189. S. E. | 42 | Gon. repeatedly. | Stream passed with difficulty 12 years ago. | Stricture and retention; numerous perineal abscesses. |
| 190. J. M. | 48 | Gon. 30 years ago, not since. | Stream observed to become smaller 10 years ago, without any assignable cause. | Stricture, retention and incontinence. |
| 191. E. G. | 59 | Gon. three times.<br>Last attack of long duration. | Stream observed to diminish 15 months after last attack; retention occurs after excess of any kind. | A very narrow and obstinate stricture. |
| 192. ——. | 52 | Gon. three times. | Stream passed with difficulty about 12 months after last attack; irritable bladder; retention and extravasation. | Very narrow stricture and perineal fistula. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 193. ——. | 36 | Made a smaller stream than natural in childhood, and much incontinence then; slight gon. 10 years ago. | Difficulty in micturition greatly increased since gonorrhœa; retention a year ago; incontinence since. | A catheter cannot be passed; perineal section and death. |
| 194. J. S. | 43 | A punctured wound in the perineum at 13 years of age, through which the urine passed. | Wound healed in three months: soon after the stream became smaller, the wound re-opened, and fistula remained. | A narrow stricture and calculus vesicæ. |
| 195. G. M. | 26 | Gon.<br>Very chronic. | | Stricture of three years' standing. |
| 196. T. S. | 30 | Gon.; very intemperate.<br>Chronic and aggravated by horse exercise. | | Narrow stricture, from the effects of which the constitution has suffered. |
| 197. J. W. | — | Gon. 25 years ago. | Soon after, was exposed greatly to wet and cold; three weeks after had difficulty in passing water, gradually increasing since. | Stricture; extravasation of urine. |
| 198. W. P. | 44 | Gon. at 19.<br>Gleet following for a year. | Symptoms of stricture observed six years after. | Narrow stricture. |
| 199. G. B. | 24 | Gon. nine months ago. | Stream observed to become smaller, since discharge has ceased. | Narrow stricture; urine passes by drops. |
| 200. J. W. | Midd. Age. | Gon. 16 years ago; stream of urine smaller than natural since childhood.<br>Severe and long continued. | Symptoms of stricture soon followed the gonorrhœa. | Very narrow stricture; extravasation of urine. |
| 201. R. B. | 30 | Gon. two years ago; difficulty in passing water then, which soon subsided; gon. again three weeks ago. | | Complete retention from inflammatory obstruction, occurring at about three inches from the orifice. |
| 202. J. M. | 25 | Gon. several times; last attack year and half ago.<br>Lasting four months. | After which first observed difficulty in making water. | A narrow stricture; extravasation of urine. |
| 203. L. S. | 40 | Severe gon. three years ago. | Stream has become smaller by degrees since. | A narrow stricture; urine passes only by drops. |
| 204. —. W. | 47 | Gon. 20 years ago; strong injections used. | Symptoms of stricture observed about two years after; much treatment. | A narrow stricture; urine passes only by drops. |
| 205. —. C. | 53 | Gon. at 21.<br>Very chronic and followed by gleet. | Stream became smaller soon after. | Three strictures in the canal. |
| 206. T. H. | 50 | Injury to the perineum while learning to ride in a cavalry regiment, at 19 years of age. | Some difficulty in micturition followed; repeated gon. since have aggravated the symptoms; much treatment. | Two or three very narrow strictures; urine passes by drops. |
| 207. T. C. | 32 | Fall on the perineum on board ship two years ago. | A small stream since, and occasional retention. | Very narrow stricture; incontinence; general health bad. |
| 208. —. R. | 47 | Gon. badly treated in youth.<br>Chronic. | Symptoms of stricture appeared 19 years ago; retention two years after. | Two strictures; general health much impaired. |
| 209. M. D. | 29 | Gon. several times between 18 and 25. | Stream became smaller soon after last attack, and very soon passed only by drops. | Two narrow strictures. |
| 210. ——. | 37 | Tape-worm in the intestines. | | Producing spasmodic stricture, all symptoms of which disappeared after its expulsion; referred to p. 78. |
| 211. J. W. | 45 | Gon. four times many years ago.<br>Discharge lasting 12 months after last attack. | Symptoms of stricture appeared about 15 years ago. | Very narrow and obstinate stricture. |

| Patients' Initials | Age | Antecedents and Supposed Causes | Access and Progress of the Disease | Present Condition |
|---|---|---|---|---|
| 212. J. H. | 52 | A kick on the perineum four years ago, followed by retention. | Treatment for stricture ever since. | Impassable stricture. |
| 213. J. L. | 43 | Gon. 25 years ago. | Symptoms of stricture first observed about five years after; attacks of retention during last seven years. | Impassable stricture and fistula. |
| 214. A. B. | 25 | Blow on the perineum two years ago, with much pain. | Retention a month after. | Impassable stricture, abdominal and perineal fistulæ, and calculus vesicæ. |
| 215. H. L. | 24 | A sack of flour fell on him when seven years old, forcibly bending his trunk on his thighs; retention immediate. | Urine has never passed freely since; retention about eight years after from violent cold; a kick five months ago made him worse. | Stricture and retention. |
| 216. M. N. | — | Chancres on the prepuce and at the meatus externus. | | Three months afterwards the orifice was diminished to one-third of its original size, and division of the cicatrix was performed. |
| 217. A. B. | 27 | Severe gon. 12 years ago; chordee, during which the penis reived a heavy blow; hæmorrhage followed. | Three months after an abscess in the front of the scrotum. | Stricture followed at the site of the abscess. |

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